UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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Contents

Naval and Military Decorations.—Richards	575
The Woozlefinch: The Navy 14-Inch Railway Guns.—Bunkley	584
The War on War.—Cox	599
Water Losses from Submarine Storage Batteries.—Madden	606
International Hydrographic Bureau.—Long	609
World Economics and Disarmament.—Bryant	623
Exterior Ballistics—Wind Correction.—Raftery	630
Three Veterans of the United States Navy.—Perry	632
Fitness Records and Selection for Promotion.—Cooke	647
Across the Continent by Automobile.—Allen	653
Ship Personnel and Gas Warfare.—Ellis	657
Duty Beyond the Seas.—Lathrop	661
Discussions	671
Professional Notes	676
Notes on International Affairs	697
Book Reviews	702
Secretary's Notes	711

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1. MEDAL OF HONOR

2. MEDAL OF HONOR ROSETTE

3. VICTORY BUTTONS

4. DISTINGUISHED SERVICE CROSS

5. CERTIFICATE OF MERIT

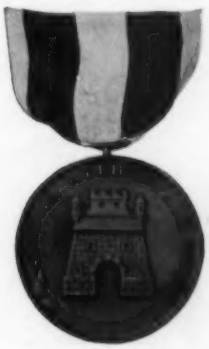
6. OLD MEDAL OF HONOR

7. DISTINGUISHED SERVICE MEDAL

8. PORTO RICO OCCUPATION

9. CIVIL WAR

10. INDIAN CAMPAIGN



11. SPANISH CAMPAIGN

MEDALS OF MERIT AND SERVICE—UNITED STATES ARMY

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12. CUBAN OCCUPATION

13 PHILIPPINE OCCUPATION

14. CONGRESSIONAL PHILIPPINE

15. SPANISH AMERICAN WAR

16. CUBAN PACIFICATION

17. CHINA RELIEF EXPEDITION

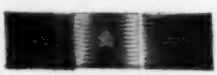
18. MEXICAN BORDER SERVICE

19. MEXICAN CAMPAIGN

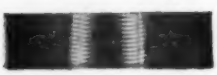
20. LIFE SAVING 1ST CLASS

21. LIFE SAVING 2D CLASS

No more than one medal of honor, distinguished service cross, or distinguished service medal shall be issued to any one person. But for each succeeding deed or act sufficient to justify the award of a cross or a medal, a bronze oak leaf cluster will be worn in lieu of another cross or medal.



For each citation for gallantry in action published in orders from headquarters of a force commanded by a general, not warranting the issue of a cross or medal, a silver star will be worn on the ribbon.



A Bronze star will be placed on the Victory Ribbon for each battle clasp the wearer has preserved.

A Bronze numeral will be placed on the Expedition Ribbon of the Marine Corps to denote the number of expeditions participated in by the wearer.

MEDALS OF MERIT AND SERVICE—UNITED STATES ARMY

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22. NAVY CROSS

23. MEDAL OF HONOR

24. DISTINGUISHED SERVICE MEDAL

25. OLD MEDAL OF HONOR

MEDAL OF HONOR ROSETTE

26. CIVIL WAR

VICTORY BUTTON.

27. U. S. MARINE CORPS GOOD CONDUCT

28. MERITORIOUS SERVICE

29. GOOD CONDUCT NAVY

MEDALS OF MERIT AND SERVICE—UNITED STATES NAVY AND MARINE CORPS

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30. SPANISH AMERICAN WAR

31. PHILIPPINE CAMPAIGN

32. SAMPSON MEDAL

33. CHINA RELIEF EXPEDITION

34. DEWEY MEDAL

35. CUBAN PACIFICATION

36. NICARAGUAN CAMPAIGN

37. HAITIAN CAMPAIGN

38. MEXICAN CAMPAIGN

MEDALS OF MERIT AND SERVICE—UNITED STATES NAVY

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UNITED STATES
NAVAL INSTITUTE
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NAVAL AND MILITARY DECORATIONS

BY BRIGADIER GENERAL GEORGE RICHARDS, U. S. MARINE CORPS

THE custom of bestowing medals or decorations on meritorious individuals, or granting special honors, has prevailed in nations of Europe and elsewhere for many years. Only in recent times, however, has the practice become established in America. To mark in this way outstanding services or achievements or special acts of gallantry has a very broad purpose. It engenders a spirit of emulation. It so encourages like acts of devotion by others. It does not fail to add to the morale and the efficiency of national defense. The custom at no time has escaped the attention of our commanders. There is a tradition in this particular recently disclosed in the public prints. George Washington, at Newburgh-on-the-Hudson, established in 1782 the Order of the Purple Heart. Any of his force recommended for exceptional conduct in battle had that emblem awarded him and a cloth purple heart was sewed on the left breast of his tunic. The text of his order instituting this decoration is interesting. It reads:

Headquarters, Newburgh, Aug. 7th 1782

Honorary badges of distinction are to be conferred on the Veteran Non-commissioned officers and soldiers of the Army, who have served more than three years with bravery, fidelity, and good conduct; for this purpose a narrow piece of white cloth, of an angular form, is to be fixed to the left arm, on the uniform coat. Non-commissioned officers and soldiers who have served with equal reputation more than six years, are to be distinguished by two pieces of cloth, set on parallel to each other, in a similar form. Should any who are not entitled to the honors, have the insolence to assume the badges of them, they shall be severely punished; on the other hand it is expected those gallant men who are thus distinguished will on all occasions be treated with particular confidence and consideration.

The General, ever desirous to cherish a virtuous ambition in his soldiers, as well as to foster and encourage every species of military merit, directs that whenever any singularly meritorious action is performed, the author of it shall be permitted to wear on his facings, over his left breast, the figure of a heart in purple cloth, or silk, edged with narrow lace or binding. Not only instances of unusual gallantry, but also of extraordinary fidelity and essential service in any way shall meet with a due reward. Before this favor can be conferred on any man the particular fact, or facts on which it is to be grounded must be set forth to the Commander in Chief, accompanied with certificates from the commanding officers of the regiment and Brigade to which the candidate for reward belonged, or other incontestible proof, and, upon granting it, the name and regiment of the person, with the action so certified, are to be enrolled in the book of merit, which will be kept at the orderly office. Men who have merited this last distinction, to be suffered to pass all guards and Sentinels which officers are permitted to do. The road to glory in a patriot Army, and a free country, is thus opened to all. This order is also to have retrospect to the earliest stages of the war, and to be considered as a permanent one.

Apparently this badge was bestowed but rarely; a condition many feel should obtain under our existing systems. The value of any decoration is in inverse proportion to the ease with which obtained. So far as existing records show, only three American soldiers ever received the Order of the Purple Heart. They were Sergeant Daniel Bissel of the 2d Connecticut Regiment, Continental Army; Sergeant Daniel Brown of the 5th Connecticut Regiment, Continental Army, and Sergeant Elijah Churchill of the 2d Continental Dragoons, also a Connecticut organization.

The practice prevailing in other nations accorded in the main to an established system. Such a system was not looked upon with favor by our people at the beginnings of our nation. While, in the earlier days of the development of our Republic, the Congress did not fail, on occasions of notable victories by our land and sea forces, to pass resolutions of thanks directed to their commanders and sometimes bestowed swords of honor or authorized commemorative medals to be struck, it was never intended that these medals were to be worn. There was perhaps reason for this condition. Our founders did not look with favor upon systems savoring of the practices of monarchial governments. Our Constitution forbids the American officer, without the consent of the Congress, to accept from any king, prince, or foreign state an office, emolument, title, or decoration of any kind. Our government in its development in later years studiously avoided the creation of any plan or system for bestowal of orders or decorations. What prevailed elsewhere in governments differing from our own system of representative democracy had no appeal to the people of America.

Students of our early history, in the era immediately following the establishment of American independence, are amazed to read of the storm of disapproval that swept our country with the announcement from Newburgh-on-the-Hudson, the camp of our victorious army of the war of the Revolution, that its officers proposed to create the Order of the Cincinnati. The members of that order were to wear its insignia. And the right to membership was to descend to the eldest son of the officer-member. Despite the statement that the institution was nonpolitical, that its object was solely to keep alive the friendly relations established in their associations in the field and to cherish the memories of the honorable part they had taken in heroic struggles that had just ended, and that through the order it proposed to undertake the duty of aiding the needy widows and the orphan children of its members, few of our people of those days failed roundly to denounce the Order of the Cincinnati.

Our grandmother's cosy garrets have yielded scores of musty, yellow, dog-eared pamphlets crowded with italics and exclamation points inveighing in passionate language against that wicked and dangerous Cincinnati. It was an aristocracy of men in gold lace and epaulettes that would not fail in due season to plot against American liberty. The men of Massachusetts said, "Have we thrown overboard the effete institutions of Europe only to have them reintroduced in such a surreptitious fashion?" And Rhode Island even proposed to disenfranchise the members of the order. A swarm of brochures flooded the country in rejoinder and rebutter. Not until early in the nineteenth century did the controversy end. It is easy for us to smile at this futile outcry against the Cincinnati. That order stands before our public of today as an honored society of great distinction. But influences engendered did not end when the controversy ceased to occupy popular attention and passed from man's memory.

Not until three-quarters of a century later could the Congress of the United States be persuaded to take a more rational view of the thought of the soldier and create what once had appeared as a practice savoring of a European system. It is interesting to note that in this long period of time there had been displayed on the part of the Congress measures of liberality or looseness with regard to the same subject matter. Laws were frequently enacted granting the right to persons in the military and naval services to wear certain insignia with their uniforms. These insignia were the official emblems of a number of hereditary patriotic societies established to commemorate our various wars and military campaigns. Apparently there had been no serious objection on the part of the Congress so to mark individuals in uniform as descendants of men rendering service in war. But these bought-and-paid-for plus three dollars a year medals did not appeal to the man-at-arms.

To recognize a deed performed by one of us in his own person by a mark or symbol conspicuously displayed by that individual before his comrades had to the soldier a different appeal. The glorification of the services of one's ancestors bespeaks only family pride. What the soldier wanted was some measure to create the proper spirit of emulation in the military forces, for thereby the stimulated morale would redound to the country's good through added efficiency of the organization. That *esprit*

de corps is one of the strongest of impulses to great deeds. Gallantry in battle in the eyes of every race is the acme of accomplishment. This has always been true; it will never be otherwise. Marks of distinction displayed in person by men who have earned them in the field cannot fail so to exalt their associates that no opportunity to do likewise will be neglected.

Our country in the early sixties of the last century was entering the throes of a Civil War; the life of the Republic was at stake; then was the time to encourage individual sacrifice. For otherwise our sacred American institutions might not survive. In 1861, we find the Congress taking its first rational view of the subject matter of decorations to be worn by their holders. It authorized the issue of a Medal of Honor to meritorious officers and soldiers of the Army, restricted in general to those especially distinguished in battle. In the following year, 1862, that honor was extended to the naval personnel, but, strangely to us, restricted to the enlisted men of the Navy, including the marines. The holders were men distinguishing themselves in battle or elsewhere by extraordinary heroism in the line of their profession. Their promotion to the warrant grade was authorized, they might be bestowed with the Medal of Honor and be given a money gratuity.

Why the commissioned officer of the Navy or Marine Corps was excluded from such a recognition is unknown. This condition prevailed until 1915. Then the Congress authorized that that form of decoration, viz., the Medal of Honor, might be awarded in meritorious cases to commissioned officers of the Navy, Marine Corps, and Coast Guard. Within this period, from 1862 to 1915, the Congress reverted on two occasions, viz., in 1898 and 1901, to its former practice. It authorized the issue of commemorative medals to be distributed to participants in the Battle of Manila Bay, May 1, 1898, under Admiral (then commodore) George Dewey, and to like participants in certain naval and other engagements in the West Indies and on the shores of Cuba in the war with Spain.

Not until our military forces had served in the field in intimate relations in campaign with like forces of other nations did any plan evolve constituting a system for marking such service by the issue of commemorative badges to participants. That contact came thirty years ago. Then forces of the Army, Navy, and Marine Corps served in the Boxer hostilities in North China. The system then in vogue in the British service of marking such campaigns was made known to us by our comrades of the Royal Welch Fusiliers, a regiment created by William of Orange in 1689, distinguished in the military history of Great Britain. We must give credit, however, to the late lamented Lieutenant General Adna R. Chaffee, U. S. Army, who, as a major general of the U. S. Army, commanded the American units in the China Relief Expedition, not only for the inspiration to create for the American Army something similar to the British practice, but also for its institution in 1904. Then General Chaffee acted as chief of staff of the United States Army, stationed at the War Department in Washington.

The existing system of prescribing campaign badges for the Army was one there created by him. Later, upon the initiative of Major General George F. Elliott, Commandant, U. S. Marine Corps (then brigadier general), these Army methods became applied, not alone to the Marine Corps but to the entire naval service. The archives of the War Department as well as of the Marine Corps contain some interesting documents covering the subject. To mark a soldier identifiably as a veteran of a previous campaign by an appropriate badge was, as indicated, unheard of so far as concerns our own services.

On September 19, 1904, several months after General Chaffee assumed duty as chief of staff, he directed a study of the problem by the general staff. Its solution was entrusted to Brigadier General J. T. Kerr of the general staff (now retired and then lieutenant colonel). His report contains the colorful details. About this time the public writer and war correspondent, Richard Harding Davis, had written the President (the Honorable Theodore Roosevelt) on the general subject of military decorations. Mr. Davis brought to notice the hypothetical case of a newly graduated West Pointer under orders to join his first regiment, with his military career then a closed book of unlettered and unnumbered pages. This young officer was assumed to come from a line of ancestors who participated in every American war; he was a hereditary

member of all existing societies or orders to commemorate these wars. By virtue of these services of his forbears and not by reason of any services of his own, this young officer had the right under the law to wear the insignia of these various orders or societies.

Mr. Davis demonstrated that this embryonic hero could, under the authority of the law, appear before the eyes of his first commanding officer, an undecorated and grizzled veteran of many conflicts, bearing on his virgin, sturdy, youthful chest at least twenty-one decorations. Colonel Kerr, however, showed that Mr. Davis had made a slight miscalculation. He had underestimated the situation. Our subaltern was entitled to be adorned by at least five more medals than the Davis count; he could wear twenty-six in all. Of course, all know full well that no such young officer, thus bemedalled, would have dared so to present himself, law or no law. But these statements aptly illustrated, and in a very striking way, the fallacy of the American attitude and the inconsistencies of the Congress in dealing with the subject. There is perhaps an easy explanation for the anomaly. We should remember that while we of the military-naval profession usually cast no vote, the members of the various hereditary, patriotic, and commemorative societies number many men in civil life who do. It is, therefore, comparatively an easy matter for these societies to secure the legislation they regard as necessary for the full recognition of the privileges of their respective institutions, including laws conferring upon all members the right to wear their respective insignia with the United States uniform.

Now the solution of the problem entrusted to the general staff was no easy matter. They had to deal not only with the past inconsistencies of the Congress, its prejudices originating from the ancient days of our infant Republic, but also some very practical considerations. What pleases us to call virtuous and soldierly conduct, and the considerations underlying such conduct, are matters that necessarily do not appeal to the civilian. The civil code is different from the military. What we hold to be military crimes come not under the ban even of misdemeanors in their relation to the civil. Now the soldier may not quit his job nor transfer his allegiance to another competitor. We hold that the deserter and the traitor merit but one end. The soldier also must be punctual; he must be alert and watchful on duty; he must be neat in his person and particularly in his care of the implements of war, his rifle, entrusted to his keeping. If failures in these particulars are the rule, the military organization becomes inefficient and unreliable. We cannot treat such derelictions with the leniency observed in the civil code. We look upon these offenses as high crimes—some carry with them, in war, the penalty of death. Our soldier must so behave at all times that success in battle may fall to our arms. Measures that inspire him to be forgetful of self are important. Courage in the individual is so essential to our success in action that every means must be employed to instill and develop it. Cowardice means failure.

To ask of the civilian legislator to consider and to initiate a satisfactory code to cover a system of military decorations was an appeal to be resorted to only under the doctrine that such a procedure was an absolute necessity. Public opinion flushed by news of victories had influenced the Congress to recognize the service of successful commanders. But could it be expected of the Congress, in the piping days of peace, to establish the code of decorations desired? On the other hand, had not the Congress entrusted sufficient authority to the Executive to consider and institute the foundations upon which the desired system could be built? Could what was wanted lawfully be done by our Commander in Chief, The President? That was the question General Chaffee wanted the general staff to answer.

The problem for the general staff to solve, under Colonel Kerr, was to devise the foundations of a system for bestowal of badges to the individual, distinctive of his particular service as rendered, either with or without the immediate authority of the Congress, as the necessity of the case might dictate. It was found that under the authority of Section 1296 of the Revised Statutes, reading thus:

> Sec. 1296. The President may prescribe the uniform of the Army and quantity and kind of clothing which shall be issued annually to the troops of the United States.

The President had authorized as part of the uniform of the enlisted force of the

Army, certain distinctive badges, among which were the "service chevron," and the "service in war chevron." Thereby the number of enlistments, or length and the character of the previous service, of this enlisted veteran was at once to be recognized.

Colonel Kerr proposed that the fullest advantage be taken of this delegated authority of the Congress so vested in the President of the United States. The plan proposed was one subject to further enlargement by legislation after the bases of the approved system might be established, even, if necessary, that legislation be attempted to the end that these non-governmental decorations could be retired from further use and in favor of the badges the proposed system was to initiate. The plan as drawn up was one for the immediate issue of campaign badges to commemorate and distinguish the participants in service then who were veterans of recognized wars and campaigns. These badges were to be part of the Army uniform. The plan was examined by the Judge Advocate General of the Army (Brigadier General George B. Davis) and by the Quartermaster General of the Army (Brigadier General Charles F. Humphrey). It was pronounced to accord to authority granted by the law; money was found available in current Army appropriations. This plan, as a basis for a system of decorations, was submitted to the War Department by the chief of staff (Lieutenant General Adna R. Chaffee). On January 4, 1905, it was heartily endorsed by the Honorable Robert Shaw Oliver, Acting Secretary of War, and later promulgated to the Army in General Orders Nos. 4 and 5, War Department, January 11 and 12, 1905.

The plan contemplated the issue, according to existing regulations, of campaign badges as an article of uniform under the authority of the President, but only to officers and enlisted men *then* in the Army. These badges were to mark those then on the rolls of the Army who had served in campaigns in the Spanish, Philippine, China, Indian, and Civil Wars. The expense of purchase was to be borne from current Army appropriations. The officers were to reimburse the government for the cost of their badges. The statutory privilege of wearing the insignia of hereditary patriotic societies was recognized and confirmed. But by a clever provision inserted in these orders their display on the uniform was discouraged. Those who desired to exercise their statutory rights could not wear them with the new campaign badges. It was not proposed that oil and water be mixed. These campaign badges were not, without authority from the Congress, to be issued to anyone not then in the Army. Men who had left the service being prohibited from wearing their former uniforms, the campaign badge as part of that uniform could not then be issued to them. It was only for those on current Army rolls.

History recalls that Joan of Arc at her inquisition was asked why her standard had been placed with the Royal emblems of France at the coronation at Rheims. She replied in simple, beautiful language that will live as long as language is spoken: "It had borne the burden; it had earned the honor." With the issue of these badges to the Army there came to us, and at once, a flood of applications from the marines that they receive them. They had participated with the Army in the campaigns in the Philippines and in Cuba. They had borne there the burden. How about the honor? But the War Department had then but one answer. Its child must not die a bornin'. No article of Army uniform, paid for in the case of its enlisted personnel from Army appropriations, could, without specific legislative authority, be issued to anyone not then in the Army, not even to participants since discharged from the Army; certainly not to the marines, no matter upon what basis, in common justice, their right thereto rested.

A plain inference could be drawn from this attitude. It did not take long for us to arrive at the correct conclusion. Could we not with equal propriety and like legality cause these selfsame badges to be made an article of uniform for the interested naval personnel? Then would it not follow that our veterans, participants in these distinguished campaigns, could properly be marked with like honors? But the quartermaster's department of the Marine Corps, then presided over by the late Colonel Frank L. Denny, said there was no money available in the Marine Corps appropriations to cover the cost; that their use for such object, was of doubtful legality; in fact he said that the entire proceeding was of the same tenor, at least in his estimate of the situation. So

there the matter, for the time being, rested.

It is true that neither the Navy nor the Marine Corps has any statute, as that quoted for the Army, vesting in the President authority to prescribe articles of uniform. But such has been done by executive, rather than legislative authority, from the very beginnings of the naval establishment, and long usage, lawyers say, makes law. There was a further obstacle that troubled us. While there was appropriation to defray any expense for purchase of material for uniforms of the enlisted naval personnel, excluding the marines, the issue of the finished product to the bluejacket was a charge against his pay. The badge, in this situation, if authorized for the Navy as an article of uniform, would only go to the enlisted marine free of cost. In these conditions we turned to Brigadier General George F. Elliott, our commandant, and bided the time when he could take the situation in hand.

On December 18, 1907, when these campaign badges had been in fact distributed to the Army, when they were being currently worn by our comrades of the Army of our Philippine expeditions and of North China, it was thought the appropriate time to act. On that date General Elliott proposed to the Navy Department that the identical campaign badges with ribbons, then being so worn by those of the Army entitled to the privilege, be adopted, so far as practicable, as part of the uniform of the Navy and Marine Corps; that they be issued to our personnel there associated with the Army; that, preliminary to departmental action, an authoritative decision be obtained from the then comptroller of the treasury as to which of the specific appropriations, if any, for the support of the naval establishment, were available to meet the expense of purchase, and that the conditions underlying the issue of these articles of uniform to the veteran personnel of the Navy be further determined.

The Secretary of the Navy, the Honorable Victor H. Metcalf, acted promptly upon these representations. The first answer came in due time over the signature of the Honorable Leander P. Mitchell, then assistant comptroller of the treasury. He said that, if these decorations be prescribed as part of the uniform of the Navy and Marine Corps, the expense of purchase and issue would be chargeable to the "Clothing and Small Stores Fund" for the Navy, and the appropriation "Clothing, Marine Corps" for the Marines. Their issue was to be under the same condition as any other parts of the uniform. From this followed what we anticipated, that the enlisted marine would receive his decoration free of expense, while the officers of the Navy and Marine Corps, and the enlisted men of the Navy, had to pay for its cost. When this condition was understood by Secretary Metcalf, he directed that appropriations be asked for in the annual estimates then before the Congress to cover all the expense, so that all would be treated alike. Congress acted favorably May 13, 1908. As a result there was no reason to adopt the rigid rules found necessary in the Army at the institution of the system. The naval service was informed through promulgation of Special Orders Nos. 81 and 82, dated Navy Department, June 27, 1908. This congressional sanction of the Navy Department's action, this act of making appropriations, by the legislative department of our government, for the object of the issue of these campaign badges, free of cost, to men since discharged, and to officers of the Navy and Marine Corps, has a wider significance. The Navy had succeeded most effectively in fortifying what the Army had initiated upon its own responsibility. That success with the Congress laid the groundwork for later legislative acts enlarging the systems. In the World War, General John J. Pershing asked for proper steps to be taken in this direction. He has explained his action in the following terms:

> The problem of decorations in our Army had long been a knotty one, and except for the Medal of Honor and the Certificate of Merit we had only campaign badges and those given for marksmanship. The allies desired to confer their decorations on our men who served with distinction under them, but we were not permitted to accept foreign decorations without permission from Congress.
>
> There is no doubt that some sort of visible evidence of exceptional military service arouses pride and stimulates effort. The generous bestowal of decorations in each allied Army by its commander in chief was unquestionably an important factor in maintaining the morale of their troops. Our own Medal of Honor had inspired many a heroic act.
>
> As it was a matter of importance to our officers and men, the whole question of decorations was taken up by the War Department on my suggestion, with the result that congressional action established certain medals of our own and author-

ized our soldiers to receive those of foreign governments.

The medals created by Congress at this time were the Distinguished Service Cross for extraordinary heroism in connection with military operations against an armed enemy, and the Distinguished Service Medal for exceptional meritorious service in a position of great responsibility, which replaced the Certificate of Merit. There were in addition to the Medal of Honor, our highest decoration, established in 1862, for gallantry and intrepidity at the risk of life above and beyond the call of duty. The award of the Certificate of Merit was discontinued.

Authority was also eventually given the War Department to confer our decorations on allied officers and men who had rendered deserving service with our armies. The different grades of medals in the various countries were not entirely the same as ours. We had none that corresponded to the French or Belgian *Croix de Guerre*. There ought to have been one for gallantry in action somewhat less conspicuous than that covered by the Medal of Honor or the Distinguished Service Cross. I made a recommendation to this effect, but nothing came of it.

There were thousands of instances in our armies where a medal of this class should have been bestowed. We were as liberal in decorating allied officers and men as the provisions of our law would permit, and there is no doubt that the exchange of decorations helped materially to promote friendly relations.

The enactments followed of July 9, 1918, for the Army, re-creating the Medal of Honor and instituting the Distinguished Service Cross and Distinguished Service Medal as well as other decorations, and that for the Navy, February 4, 1919, re-creating similarly the Medal of Honor and instituting the Distinguished Service Medal and Navy Cross and other medals.

These laws prescribe a Medal of Honor for the Army and one for the Navy, supposedly of equal importance, to be bestowed upon any person in the military or naval service who should "in action involving actual conflict with an enemy distinguish himself conspicuously by gallantry and intrepidity at the risk of his life, above and beyond the call of duty." There is one distinction, however, in the case of the Navy Medal of Honor. It is further restricted to acts "without detriment to the mission of his command or the command to which attached," a condition that does not apply to the Army.

There were, prior to these enactments, three cases in the Army of officers and enlisted men awarded more than one of the then existing Congressional medals; there are two cases in the Marine Corps of officers or enlisted men receiving more than one of the then like Navy Medals of Honor.

The next decorations of importance are; for the Army the Distinguished Service Cross, on a parity with the Distinguished Service Medal for the Navy. The Distinguished Service Cross for the Army, however, is restricted in its award to persons, male or female, "distinguished by extraordinary heroism in connection with military operations against an armed enemy," while the award of the Navy Distinguished Service Medal is limited to any person, apparently male, who has "distinguished himself by extraordinary meritorious service to the government in a duty of great responsibility."

The next decorations in order of their importance are, for the Army the Distinguished Service Medal, apparently co-equal with the Navy Cross. The Army Distinguished Service Medal is limited in its award to any person, male or female, who "has distinguished himself or herself by extraordinary meritorious service to the government in a duty of great responsibility," while the Navy Cross, on the other hand, may be bestowed upon any person who shall "distinguish himself by extraordinary heroism or distinguished service in the line of his profession, such heroism or service not being sufficient to justify the award of a Medal of Honor or a Distinguished Service Medal."

Both the Army and the Navy laws provide that no more than one Medal of Honor, one Distinguished Service Cross, one Distinguished Service Medal, or one Navy Cross, shall be issued to any one person, it being further provided for both services that succeeding deeds or service should be marked by the award of a suitable bar, device, emblem, or insignia, to be worn with the decoration.

The time limit for award of the Congressional Medal of Honor, Distinguished Service Cross, and Distinguished Service Medal for World War service, expired seven years ago, but a special act of Congress in 1928 authorized the War Department to consider for further awards all applications which were pending when the time limit expired. Under this extended authority a number of decorations have been conferred during the past few years.

So far ninety-three awards of the Con-

gressional Medal of Honor "for individual acts of gallantry in the World War" have been made, in addition to six medals bestowed on unknown, unidentified soldiers and one conferred on Colonel Charles A. Lindbergh by special act of Congress. Before the World War a total of 1,723 Congressional Medals had been issued.

There is also specific statutory authority for certain other decorations, viz.: The Philippine Congressional Medal of Honor, for the Army alone; the Distinguished Flying Cross, identical in all details for the Army and the Navy; and the Soldier's Medal, solely for the Army with nothing similar for the Navy. These include such distinctly military-naval decorations as may be classed as statutory. The others, i. e., the campaign badges, not forgetting good conduct medals and marksmanship badges, all rest more upon the administrative authority of the executive branch of the government, though they all receive in one form or another the sanction of the legislative. These campaign badges include now medals for field service in the Civil, Indian, and the Spanish Wars, in the Cuban occupation and that of Porto Rico; also service in the Philippines in the "days of the Empire," and in China in the Boxer hostilities. Badges have also been issued to cover the Mexican service at Vera Cruz and the concurrent Mexican border service of the Army. There is also the Victory Medal to commemorate any military-naval service in the World War.

The foregoing, in general, include the Army campaign badges. The Marine Corps badges include these Army campaigns with special ones for service in Haiti in 1915 and 1919-20, Santo Domingo in 1916, the Nicaraguan campaigns of 1912 and 1927-29, and all Marine Corps expeditionary services not otherwise classified. There is a more recent Navy campaign medal prescribed for that service known as the Yangtze patrol. The statutory authority for these badges is found in the Navy in sustaining appropriations in current naval appropriation acts; in the Army in that provision of the act approved May 12, 1928, which reads:

> Sec. 3. That the Secretary of War be, and is hereby, authorized to expend from the appropriations for the support of the Army so much as may be necessary to defray the cost of the issues provided by this act.

This law was one authorizing, among other things, the Secretary of War to procure for issue without expense to the persons entitled thereto, including the families of persons deceased, of all campaign badges and other decorations then authorized by executive authority. Another enactment of the Congress of interest in relation to this subject is that approved April 21, 1928, which prohibits the unauthorized wearing, manufacture, or sale of medals and badges awarded by the War Department, and this includes service medals and badges that are known as campaign badges. The act is a penal statute providing for the punishment of any individual who knowingly offends the provisions of this law. So far as is known there is no like statute to cover similar badges issued by the Navy Department. That there should be such a law in the circumstances would seem apparent.

That these legislative sanctions, as well as these statutory extensions of the system of decorations, between the Army and the Navy, might have been made in identical terms, and that uniform methods of administration of the law and regulations might obtain, has been the thought of many officers of both services. There seems no sufficient reason to prescribe that for like acts of gallantry in each service one Medal of Honor for the Navy and Coast Guard and another of different design for the Army should be the rule. Nor is there equally reason for the Army to have one Distinguished Service Cross of a higher value and different design than is prescribed for the Navy Cross for the Navy and the Coast Guard. Nor is there warrant for different circumstances governing the various services in the award of decorations of like value. Very recently, innumerable hours and manifold efforts have been spent to bring representatives of the different branches of national defense to one mind with respect to systems of pay and plans for uniformity in promotion, factors that bear upon the morale and efficiency of national defense. That the system of awards of decorations is a like factor cannot be gainsaid.

The War and the Navy Departments are now working to develop better methods to bring about a more thorough understanding of the major problems of one service in their relation to what confronts the other, under the theory that better exchange of

information and opinion would be most helpful in times of national emergency. To this same end and for some years many of the officers of the Army have attended and become graduates of our Naval War College at Newport. Equally the reverse has obtained. Many naval officers, including those of the Marine Corps, have been graduated from the service schools of the Army, both at Washington and at Leavenworth. It has been recently proposed that the undergraduates of Annapolis and West Point receive the benefit of a series of lectures by officers of the Army and the Navy. Annapolis is thus to get, if found practicable, an insight into the Army problems, while those of the Navy are to be brought under scrutiny of the prospective Army officer at his school on the banks of the Hudson. These are conditions of today that promise much good for our nation's future security.

It is to be hoped that some workable plans may be evolved that will serve to disclose and remedy the defects apparent in our system of awarding decorations. A single system of decorations common to all the services forming our national defense would seem desirable. A more rigid administration of such a system, an administration that would serve to enhance in the service mind the value of the decoration, seems equally desirable. The future military-naval personnel must write, in its day, even brighter pages of individual achievement, more thrilling stories of personal self-sacrifice than those that have adorned the annals of our past.

This has its peculiar relation to the naval service. With our country committed with other nations to parity in ships and in guns, our success will depend more and more upon the high quality of the naval personnel to come after us. Admiral Farragut once wrote: "The best guns and the best vessels should certainly be chosen, but the victory three times out of four depends upon those who fight them." Our naval officer of the future, with his seamen, will fight under different conditions from those that obtained in our past. His weapons may be wholly unlike such as have marked that era. His problem is more difficult. That future commander with his subordinates in his heavier task must have, comparably, better men than those who have gone their way before. They must be better than the best of any nation that may oppose them. Admiral Mahan's oft repeated quotation will be true then as it has always been: "Historically good men with poor ships are better than poor men with good ships."

THE WOOZLEFINCH: THE NAVY 14-INCH RAILWAY GUNS

By Commander J. W. Bunkley, U. S. Navy

MUCH has been written describing the design and manufacture of the naval railway batteries during the World War, but little has been said concerning the operation of the batteries with the American Expeditionary Force in France. These batteries when ready for the front, were assigned to the Railroad Artillery Reserve (R.A.R.) and became an integral part of our Army. The insignia adopted by the R.A.R. was the "Woozlefinch," a fictitious specimen that was neither flesh, fish, nor fowl. This, from the fact that they were always subject to call where most needed at any time at any point along the front. Thus, the batteries became five of the biggest "Woozlefinches" ever in existence.

The Chief of Bureau of Ordnance, on November 12, 1917, recommended to the Chief of Naval Operations that a number of our 14-inch, 50-caliber naval guns be placed on railway mountings for use with our Army. This recommendation was approved on November 26, and on December 26 the Naval Gun Factory was directed to work out the details for mounting these guns. On January 25, 1918, complete plans and specifications for the material of the expedition were ready for submission to the bidders. Considering the heavy weights to be handled, the limitations of the French tunnel clearances, track and bridge weights, close and careful calculations were required. The solving of such a difficult problem and the completion of the design in such a short time was due to the highly efficient drafting room at the gun factory.

The bids for the manufacture and delivery of the material were opened on February 6 but proved to be unsatisfactory. On February 13 they were reopened and the final awards were made to the Baldwin Locomotive Works for the construction and delivery of the gun cars and locomotives and to the Standard Steel Car Company for the cars and other equipment. The date of delivery promised by the Baldwin Locomotive Company was June 15 and that for the Standard Steel Car Company about June 10.

Every means available was used to expedite the fabrication and delivery of material. The federal express from Boston, auto trucks, special messengers, and even suit cases were pressed into service. As a result, the first gun mount was complete and ready for firing on April 25, the last mount on May 25, and the cars and other equipment were all delivered by June 1.

The complete outfit of five battery units and one staff train consisted of the following:

Six locomotives
Five gun cars
Ten ammunition cars
Five battery headquarters cars
Five battery kitchen cars
Fifteen berthing cars
Three fuel cars
Five battery workshop cars
Five sand and log cars
Five crane cars
Six construction cars
Eight staff train cars, including staff headquarters, hospital, radio and spares, mess and kitchen, commissary, office, berthing, and crew's car.

Rear Admiral Charles P. Plunkett was ordered to command the batteries. In a short space of time, he had the personnel of the battery assembled and organized, and, before the batteries finally reached the front, had overcome difficulties that at first seemed to be insurmountable.

The complement of the batteries called for thirty officers and five hundred men, most of whom were to be drawn from the naval reserves. Twenty seamen gunners were selected from the seaman gunners school and about two hundred and fifty men

were picked from the various Navy rifle ranges as a result of the following letter:

Select a detachment consisting of the officer or petty officer (in charge) whose name appears in parenthesis above and thirty other men, for most important duty.

This detachment should include only excellent men. It should include several men who can do machinist work, electrical work, radio work, concrete work, signaling, locomotive engineers and firemen, trainmen, carpenters, painters, plumbers, blacksmiths, automobile men, and an assortment of men of various trades.

It is not intended that all men should be men of trades; the majority of them should be intelligent and active young men, preferably those with some education. It is not necessary that the men have ratings indicative of their trades. Select excellent all-round men without regard to rating. Hold this detachment in readiness for orders.

Submit to the Director of Gunnery Exercises and Engineering Performances a list of the men showing their rates, branch of service, small arms qualifications, the place from which received, the various duties each has performed at your range and a brief statement of his former occupation, education, and things he can do.

Hold this party as a separate detachment. Have it begin an intensive course of training, covering all the Navy small-arms courses, including daily firing for each man. Give plenty of practice with pistols and revolvers, or both, and especially plenty of machine-gun practice, each man with each type of gun. Have plenty of practice at 600 and especially at 1,000 yards.

Every man must have a thorough knowledge of the mechanism of the pistol, rifle, and each type of machine gun. Include no man who is unable to qualify as sharpshooter or higher. Have daily instruction in signaling, including semaphore, blinker, buzzer, and radio if possible.

Every night (except Sunday) have instruction. Intensify the work and eliminate all men unable or not disposed to undergo incessant work.

Make daily report of range practice and of other instruction to the Director of Gunnery Exercises and Engineering Performances.

This is for the most important and desirable duty.

One hundred men were immediately sent to Sandy Hook to familiarize themselves with large guns and to prepare a track and pit for the first mount which was to be tested there. One hundred men were sent to the gun factory and later to Indian Head for instruction in the design, assembly, and operation of the various parts of the 14-inch guns, in the actual firing of large guns and in the handling of the ammunition. And one hundred men, experienced as roundhouse foremen, brakemen, locomotive engineers and firemen, and men experienced in the construction of locomotives and cars, were selected from the Great Lakes Training Station. In early May, most of the men were assembled in camp at the Philadelphia Navy Yard where they were organized into batteries.

The officers and men left New York for St. Nazaire in three drafts; the first, consisting of 250 men and 8 officers, on May 26, 1918; the second, consisting of 207 men and 7 officers, on June 15; and the remainder after all of the material had been loaded.

The battle of St. Nazaire (as it was known to the battery personnel) began as soon as the first draft arrived. The men's trades and capabilities in civil life had previously been card-indexed and had been found to include everything from an undertaker to a major league baseball pitcher, and many of these trades were now used to advantage. Quarters had to be erected immediately. Ten days after the arrival of the first draft, the barracks, located in the railroad yards, and made from scrap lumber from locomotive packing cases, was finished. It was complete in every detail even to the little-needed "brig." The small number of men on the binnacle list spoke well for its sanitation. A large machine shop near by, having two 150-ton cranes, was used for mounting the guns and erecting the locomotives. A small temporary air plant was made from a borrowed stationary boiler and this power was used for assembling and riveting the cars for the six trains composing the batteries. The construction of a siding, on which to erect the cars, was completed and a stretch of track, about a mile in length, was obtained on which to test out the cars and to work in the bearings.

Upon the arrival of the first ship load of material, it was found that there were practically no complete units on which work might be started. The material had piled up at Philadelphia Navy Yard until it was impossible to separate it into shipments. The blue prints, showing the assembly of all the cars, were sent by special mail from the United States but never arrived. New ones were ordered by cable but the project was practically completed without blue prints before their arrival. The task of erecting the gun cars was found to be easier than the erection of the seventy-odd other cars. On no car were there less than 500 rivets and on some as many as 1,200. The packages marked rivets were found to contain stove

bolts and it was necessary to get into an automobile and search all southern France for rivets. Those obtained were metric size and some had to be drawn down to proper size. Another missing item was the painting outfit. Paint and spray guns were finally located in a small town in southern France and an officer sent down to ride the freight car back with them. In spite of these difficulties, however, the erection of the cars was not delayed. The summer evenings in France were long, lasting until 10:00 P.M., and, although the working hours were from 7:30 A.M. until 5:50 P.M., those not rating liberty were generally at work until dark.

Many high French officials visited the camp, during this period, to see the American "big guns"; but the "big guns" themselves seemed to be much less interesting to them than the skillfulness of the riveting gang. The tossing of red hot rivets to a man perched on top of a car and the expert way in which he caught them seemed to hold a fascination for the visitors.

The unloading of the ships, of course, was continuous throughout the twenty-four hours and taking 14-inch guns off of an old freighter at the water front, at midnight, with indifferent French cranemen manning the crane, was no easy task. One Sunday midnight, one of the 14-inch guns was left hanging in the air over the U.S.S. *Bath*—with the excuse that the crane had broken down. Admiral Plunkett, ever on the job, climbed to the top of the crane and, with a five-franc note, soon had the crane in working order again.

Thus the work was carried on under high pressure and the first two guns were ready for the front by the middle of August.

Many of the items that were found to be missing were obtained from the Army Engineering Corps by means of a trade. If they couldn't be obtained that way, they turned up somehow. It is a well-known fact, that, in the old days, the crew of a destroyer, when in the navy yard, was most adroit in obtaining what its ship needed. But they were pikers compared to railroad men. It was found that, when the locomotives were completed, the headlight on one of them was not satisfactory. The question was how to exchange it for a good one. But that didn't have the engine's crew stumped for very long. A French locomotive with a perfect headlight was noticed on a siding. The crew with the defective headlight promptly got up a full head of steam and started full speed toward the front end of the French engine. When they got within a few yards the brakes were applied, the engine stopped and steam was allowed to shoot out from all exhausts. The French engineer and firemen both ran for safety and before they had returned they had the defective headlight, and we had the good one. Whether or not they ever knew what happened to their light is not known, but the good light went merrily to the front with the railway batteries.

Merrily is really the word to describe the departure of the first two guns to the front. There had been quite a lot of conversation about the axle load of the gun cars. It had been found that the axle load was 11,000 lbs. heavier per axle than was indicated by the information previously received by the French authorities. A special map had been made showing what roads the batteries could travel over, and now, it seemed, that these roads would not be able to take the load. We had no fear of an overload. In fact, the first gun car was loaded with men and taken over a temporary wooden bridge to prove that the axle load was not too great; but that did not satisfy the French railroad officials.

The argument would probably not have been settled for a long time had not the Boche long-range gun opened up on Paris. Two guns were needed, and needed badly, to silence this gun and on August 17 and 18, respectively, the first two guns, minus some of the cars, as yet incomplete, left for the Compiegne Forest.

The first train departed midst great enthusiasm. Flags of all the allies were strung over the locomotive and Admiral Plunkett was at the throttle. All red tape was severed and the guns went right through in spite, at times, of the protestations of station masters.

The remainder of the batteries left St. Nazaire shortly afterwards, and from then on the journeys of these guns took them through practically every famous battlefield of the war. In addition to the moral effect the guns had on the Germans, the appearance of these giant guns on wheels cheered considerably the French populace en route. They were greeted with flowers and *finis la guerre* by the inhabitants of all the towns

through which they passed. They thought, as did the Germans, due to the mobility of the guns, that there were many more of them than really was the case.

The commanding officer of the batteries had been directed to report to the commanding general of the American Expeditionary Force as soon as the material had been erected and ready for action. Upon leaving St. Nazaire, therefore, the batteries were attached to the Railroad Artillery Reserve (R.A.R.) and the staff train proceeded to the advance base, Haussimont.

From that date until the signing of the Armistice, the railway batteries covered the front from the Oise to Luneville and participated in three major offensives. The day the first battery arrived at Compiegne, the German "Big Bertha" moved away, so this gun was ordered to the Nuisemont proving grounds for proof firing. Eight rounds were fired. The French were so pleased with the results, all shots with the same charges landing within a stone's throw of each other, that they refused to allow the expenditure of any more ammunition for this purpose.

In the meantime No. 2 battery was ordered to Rethondes, in the forest of Compiegne, to fire at a large ammunition dump at Tergnier but only one shot was fired before the town was captured. The battery was then ordered to Fontenoy-Ambleny about eight miles west of Soissons.

From the time of their arrival at the front until October 28, Nos. 1 and 2 batteries operated with the Tenth French Army, participating in the Oise-Aisne offensive. After the proof firing at Nuisemont, No. 2 battery joined No. 1 battery and was given a firing position in the cemetery of St. Christophe on the western outskirts of Soissons. From this position 199 rounds were fired on the railroads and garages north of Laon. Aërial adjustment of fire was obtained on only two days, but this observation showed that the guns were doing excellent work.

The positions of Nos. 1 and 2 batteries were near several large French ammunition dumps and No. 2 battery was very close to an important crossroads, both targets for enemy bombs and gunfire, but no direct hits were registered on the guns. On October 5, a German 6-inch naval gun opened fire on No. 1 battery but only one round did any damage. A shell landed about twelve feet from the gun mount, damaging the air compressor and cutting several exposed pipe lines. Repairs were quickly made and the enemy gun was soon located by sound observations and placed out of commission. The most exciting moments were during the nights. Every night, large enemy bombers could be heard overhead searching for the batteries and ammunition dumps and shortly afterwards explosions near by loudly indicated where the bombs had hit. The battery cars, with the exception of the ammunition cars, were always placed some distance from the firing position, and camouflaged as best they could be. On the first night the enemy bombers came over, although the men had been trained to lie flat on the ground or get into near-by trenches, many of them ran for the berthing cars, but fortunately there were no close hits. The night of September 23 was an interesting one. The Boche planes were over in force dropping bombs all around the guns. Direct hits were made on a large ammunition dump about a half mile from No. 1 train and during the remainder of the night there was a continuous bombardment from exploding shells of all calibers. Among others, some fifty thousand "75's" were exploded and as a result, most of the trees within a large radius were stripped of limbs and leaves. The engines always kept a head of steam, so that, when the shells began to drop on all sides, the train was moved about a mile up the track where it remained until the next morning.

Upon the German retreat from Laon, the former targets of the batteries were inspected. The shell craters of the 14-inch projectiles were easy to identify. They differed from the holes made by the large bombs, in that they were deeper, larger, and of a remarkably uniform size. The fragmentation of the shells was excellent and the nose of one shell was found five kilometers from the target. One shell landed in a German cinema while a moving picture was in progress. Practically the entire audience was wiped out. Another projectile landed on a moving supply train lifting a couple of box cars bodily and depositing one of them on a near-by storehouse platform. One shot was sufficient to completely wreck a railroad line of three tracks for a distance of one hundred yards, tearing up

the rails, shattering the ties, and blowing an enormous crater in the roadbed. Although the Germans were able to repair at night the damage done by the guns during the day, and thus maintain some communication, the interruption must have caused them most serious concern, both while holding Laon and also during their retreat. General Mangin and the French artillery command were delighted with the work of the guns, for, even without airplane observations, adjusting the fire only from the map, the shots were, in nearly all cases, hits.

The method of adjusting fire was a new problem for the Navy personnel. The initial range was obtained from very accurate French war maps. These maps were Lambert projections, with a north point located in Belgium. The maps were divided into kilometer squares, each square having a set of numbered coördinates. Thus when a target was given, it was stated in terms of its coördinates, as for instance 178690, 296110, and having the coördinates of the firing position, the range and direction could be figured exactly. The problem thus became a simple dead-reckoning course and distance calculation.

The guns had no artillery sights. Some British sights were ordered but could not be obtained in time. Lack of time prevented the manufacture of special sights, but a theodolite, placed on an arm attached to the deck lug on either side of gun, fulfilled the purpose perfectly. The true north was first obtained, by "shooting" the sun or north star with a sextant and from that accurately locating in azimuth a tree or some fixed object a few hundred yards away. This reference point was then converted from a "true" to a "Lambert" from a special table made for that purpose. Knowing the direction of the fixed object, the line of fire, or direction of gun emplacement, could be accurately fixed.

With angles of elevation not greater than 15 degrees (23,000 yards range) the gun was fired from the track. Being placed on an epi or curved track, the desired direction was obtained by moving the gun along the track. All that was necessary then was to set the hand brakes on the gun car. The recoil of the gun was absorbed by the hydraulic brake and the resultant reaction on the gun car was taken up in moving the car backward along the track. To enable the gun to fire at angles greater than 15 degrees, a pit with a heavy steel foundation was provided. This foundation was generally prepared in advance of the arrival of the gun car, with the aid of the battery crane car, and although the crews had been frequently drilled in placing the foundations, it generally took about twenty hours to get it ready. To prepare the gun for firing from the pit foundation was a matter of but a few minutes. From the fixed position the gun could be moved in azimuth only 2½ degrees on either side of the center line of the track; but this was ample as this angle of traverse represented a deflection on either side of the center line of 500 yards at a range of 23,000 yards, and correspondingly greater deflections at greater elevations. The targets actually used were generally from 40,000 to 45,000 yards away.

Having accurately lined up the gun on the target, it was necessary to work out the ballistics, similar to that aboard ship, in order to obtain the proper elevation and deflection at the time of fire. Stations at various points along the front were maintained by the French to obtain the weather data. These data or *Sondages* were sent out by radio every half hour and picked up by the batteries' receiving sets. Due to the height of the trajectory of the 14-inch guns, especially large balloons had to be used and, even with them, the force and direction of the wind could be obtained for only half that height.

One difficulty encountered was the fact that no means had been provided for keeping the powder at the proper temperature. This temperature was found to average about 65 degrees—a considerable loss in foot-second muzzle velocity. To remedy this, old French radiators were taken from some of the destroyed French houses in Verdun and placed in the ammunition cars. French couplings to fit could not be located anywhere but the joints were welded to the radiators, the locomotives connected up, and soon the temperature of the powder was up to 85 degrees.

Perhaps it is in order at this point to compare the 14-inch guns with the German "Big Bertha" that startled the world by its long range bombardment of Paris.

	Maximum range	*Weight of projectile*	*Muzzle velocity*	*Muzzle energy ft. tons*
German gun	121,000	204 lbs.	4,760 f.s.	41,500
U. S. naval gun	45,000	1,400 lbs.	2,800 f.s.	76,087

There is no record that the Germans contemplated firing from the tracks. This gun was fired from a turntable which took about two weeks to erect in the field after the site had been selected. There were no other guns that approached the U. S. Navy guns in range except four 340-mm. French guns.

Upon leaving St. Nazaire, Nos. 3, 4, and 5 batteries, together with the staff train, had been sent to the R.A.R. base of the American Expeditionary Force at Haussimont. Here a huge storehouse was quickly erected and the staff train remained until the Armistice.

On October 12, Nos. 3, 4, and 5 batteries, were ordered up to a position at Thierville on the outskirts of Verdun. An attempt was made on several days to get observations from this position, but without success. In fact, no observations were ever obtained while serving with the R.A.R. It was impossible to fly so far behind the enemy line except at a very high altitude. Poor visibility rendered spotting impossible. The American Expeditionary Forces had a sufficient number of aviators but very few planes. On two succeeding days, six rounds per gun were fired each day at an open field south of Longuyon, capable of being easily photographed from aëroplanes, but the height of the planes was such that no good photographs could be obtained. In order that the probabilities of hitting might be increased, a system of firing was used by which shots were placed in a spiral around the designated target, a greater number in the middle than on the outside.

Nos. 1 and 2 batteries having been ordered to join the First Army, A.E.F., Nos. 3 and 4 batteries were ordered to positions at Charny, some three miles north of Verdun. Longuyon, with a map range of 38,380 yards, and Montmedy, with a map range of 37,370 yards, then became the main objectives of these four guns, although on occasions, in order to prevent the concentration of troops at a point, targets of shorter ranges were designated.

A glance at a map will show the importance of the targets at Longuyon and Montmedy. A railroad, which had been brought to a high state of efficiency, ran almost in a straight line and parallel to the front from Metz to Sedan through Longuyon and Montmedy. The only alternative line for the transportation of troops from Metz to Sedan was a small and poorly built railroad running from Metz to Luxemburg City and thence to Sedan, forming a right-angled triangle. Montmedy was the headquarters of the Seventh German Army, had a large railroad yard, large troop barracks, and an aviation field. Longuyon contained a main railroad yard with fifteen long sidings and numerous storehouses and was a detraining point. So it can be seen that the destruction of these points would have an enormous effect on the German operations. In fact, the Germans have stated that it was "the most important artery of the army of the west."

Up to the arrival of the naval railway batteries these important troop and railroad centers had been several thousand yards beyond the range of the biggest of the allied guns. The shelling of these railroad centers therefore aided considerably in stemming the German tide, and contributed, to a large extent, to the consternation created in the German forces by the Americans' great offensive.

It was only a matter of a few hours after the first shots were fired from the positions outside of Verdun, before German planes were seen flying at a great height above the batteries, and, a couple of hours later, the three guns at Thierville were straddled with shell from a German 225-mm. gun. Luckily, no direct hits were made, only one man killed and several wounded, before the gun was silenced by counterfire.

Despite the vigorous German counterattack, a constant bombardment of Longuyon and Montmedy was maintained by the naval railway batteries. As a large portion of both towns was French, great care was exercised not to land any shell in the residential sections. The targets were the railroad yards, aviation hangars and fields, and the railroad tunnel at Montmedy. The tunnel, running at right angles to the line of fire, was a difficult target. Direct hits were registered on it but as no delayed action fuses were available, the holes were not deep enough to destroy it.

As no observations could be had, the results of the firings were obtained through the intelligence service. It was thus learned that on November 4, the entire lower Montmedy freight yards were on fire; that on one occasion a direct hit was registered on a crowded troop train; and that considerable damage was being inflicted both at Longuyon and Montmedy. One shell landed in

the headquarters of the Seventh German Army, completely demolishing it. General Gallowitz was away at the time but some of his staff were not so fortunate.

From reports received later from allied prisoners and civilians within the territory under fire, it is evident that traffic on the railroad was at all times seriously hampered and for many days entirely tied up, thereby forcing the Germans to use the railroad running through Luxemburg. Unlike the German's method of firing at regular intervals, all of the firings of the batteries were intermittent, at irregular intervals, covering a period each day from six to twelve hours. The enemy was always in range (unlike in naval warfare) ready to be fired at but, regardless of impatience, the fire had to be withheld until the proper time.

The French having requested two of the batteries for General Foch's proposed push east of Metz, on November 3, Nos. 1 and 2 batteries were shifted to new positions. No. 1 battery was located in the forest of Velorne at Champigneulles with Sarribourg as an objective and No. 2 battery was placed some twenty miles to the eastward with Benestroff as an objective. There was a tremendous artillery preparation in the vicinity of the batteries supported by the Third, Seventh, Eighth, and Tenth French Armies. The artillery in place and the accumulation of mobile artillery in the rear exceeded anything so far in the war, and with the veteran armies which were to make the thrust, it was quite evident that, had the Armistice not come when it did, Metz would have been taken from both the north and the south. A total of 782 rounds were fired against the enemy on twenty-five different days. The number of rounds, fired at any one time or on any one day, depended on the results desired. A French gun was seen that had averaged 70 rounds per year during the war while on more than one occasion the naval batteries fired 50 rounds or more in a single day.

There was no let-up in the fire of the naval batteries until the Armistice went into effect. The last shot was fired from No. 4 gun on the morning of November 11 at 10:57:30, which permitted it to land a few seconds before eleven o'clock.

The following from the official report of General Pershing, in his description of the last phase of the Meuse-Argonne offensive, shows the importance of the work of the railway batteries at Verdun:

> Our large caliber guns had advanced and were skillfully brought into position to fire upon the important lines at Montmedy, Longuyon, and Conflans. The strategical goal which was our highest hope was gained. We had cut the enemy's main line of communications, and nothing but surrender or an armistice could save his army from complete disaster.

On December 16, 1918, all the equipment of the naval railway batteries, with the exception of the ordnance material and the gun cars, was turned over to the Army for use in demobilization work. The gun cars were disassembled and returned to the United States.

The men that manned the batteries deserve a great deal of credit. Most of them fresh from civilian life, college men, railroad men, men who had never before seen a gun fired, soon became first-class sailormen, webb-footed soldiers if you will, who, in five weeks' time at St. Nazaire, assembled the whole outfit, guns, mounts, and trains, and who at the front performed like veterans, surmounted all obstacles, and handled their individual jobs in a most efficient manner.

As predicted by the French populace when the batteries were en route to the front, *finis la guerre* was not long in coming and the men of the naval railway batteries contributed, in no small way, to its end.

Courtesy Commander J. W. Bunkley, U. S. Navy

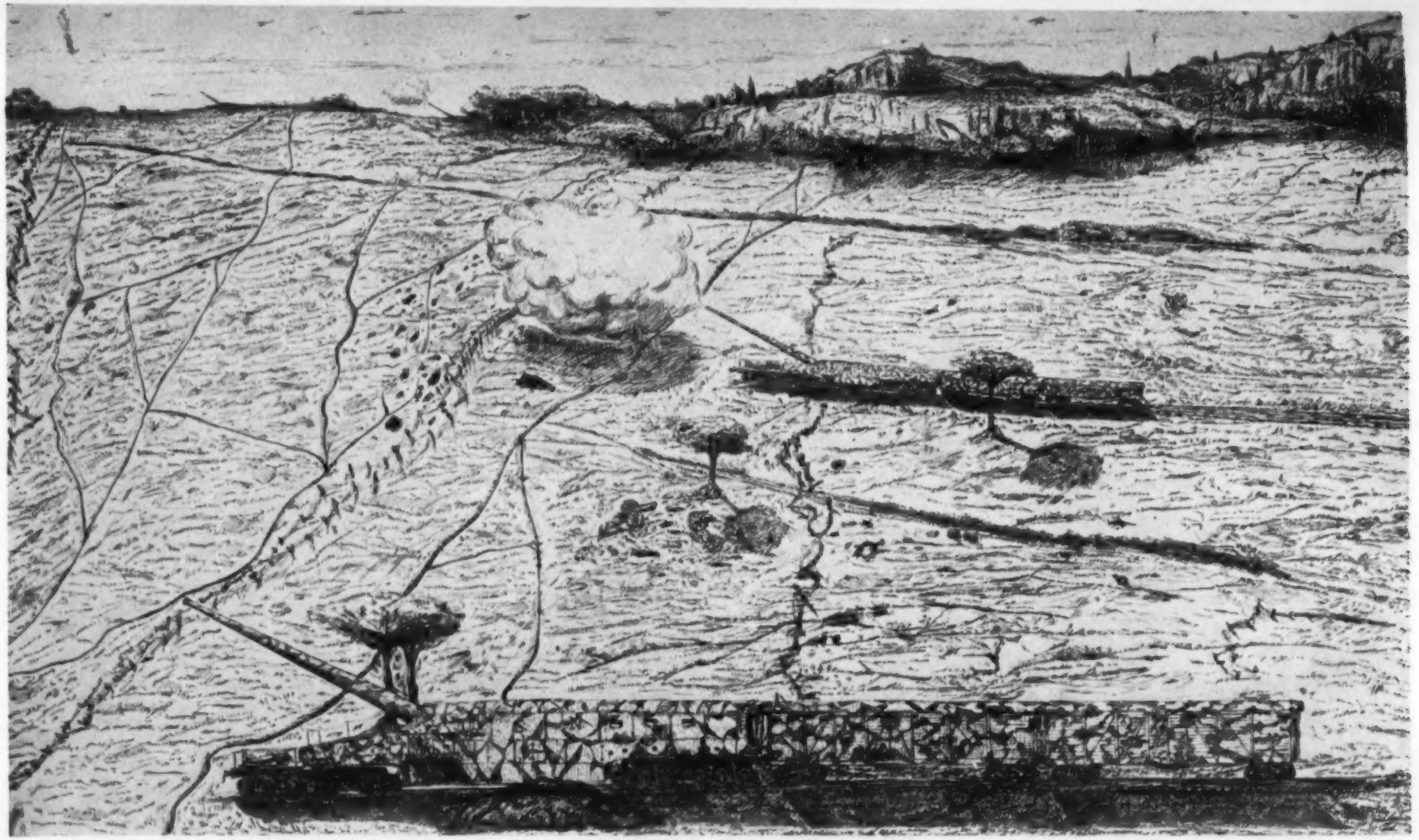
FRONT VIEW OF COMPLETE GUN CAR SHOWING ENGINE AND WINCH ON FRONT TRUCK

Courtesy Commander J. W. Bunkley, U. S. Navy

BATTERY IN ACTION AT THE FRONT

Courtesy Commander J. W. Bunkley, U. S. Navy

BATTERY IN ACTION AT THE FRONT



Courtesy Commander J. W. Bunkley, U. S. Navy

FOURTEEN-INCH RAILWAY BATTERIES IN ACTION

Courtesy Commander J. W. Bunkley, U. S. Navy

FOURTEEN-INCH SHELL CRATER, LAON, FRANCE

FOURTEEN-INCH SHELL CRATER, LAON, FRANCE

Courtesy Commander J. W. Bunkley, U. S. Navy

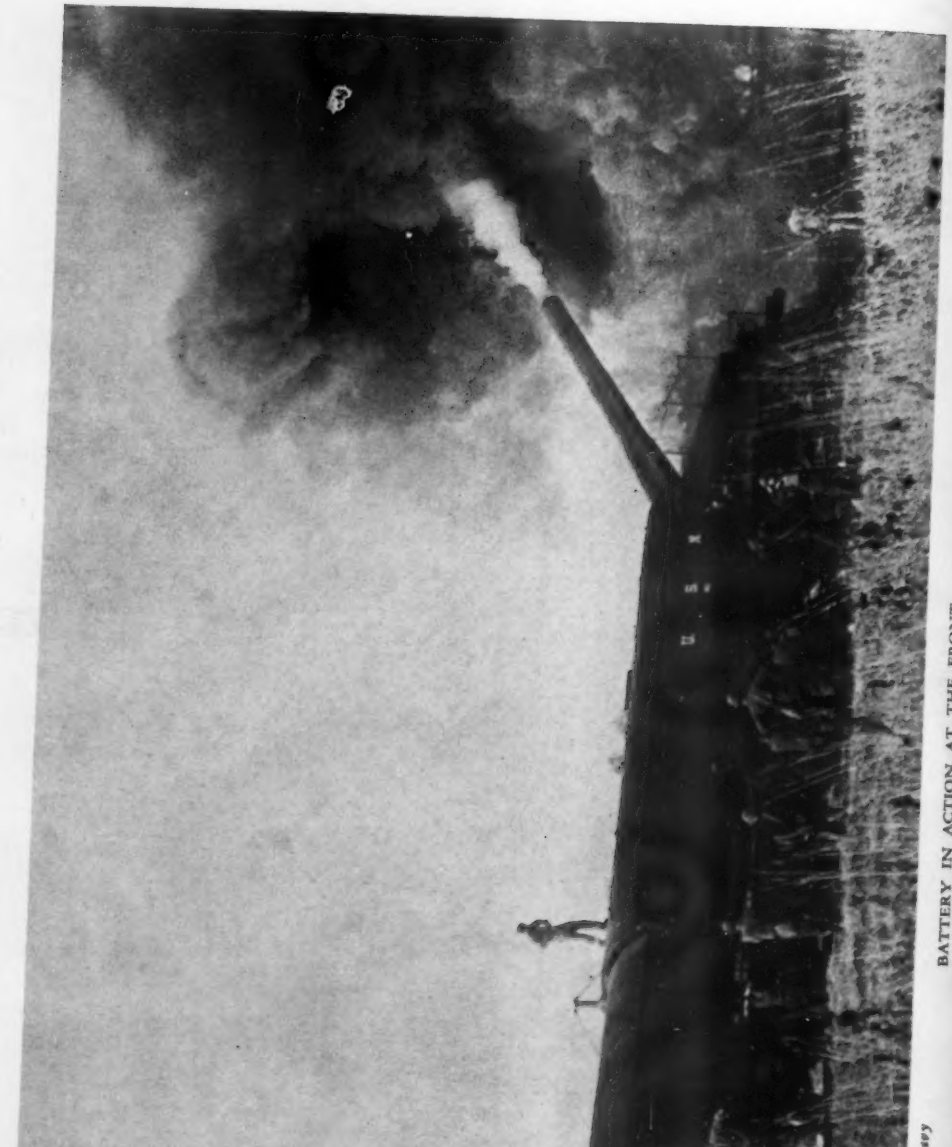
FOURTEEN-INCH SHELL

Courtesy Commander J. W. Bunkley, U. S. Navy

LOWERING 14-INCH, 50-CALIBER GUN INTO THE SLIDE OF THE FIRST MOUNT

Courtesy Commander J. W. Bunkley, U. S. Navy

U. S. NAVAL RAILWAY BATTERIES IN FRANCE
Navy 14-inch gun at Soissons, ready to fire.



BATTERY IN ACTION AT THE FRONT

Courtesy Commander J. W. Benbley, U. S. Navy

THE WAR ON WAR

By Captain Leonard M. Cox (C.E.C.), U. S. Navy (Retired)

What matters this or that reason?
What we want is more of the trade
which the Dutch now have.
—General Monk on cause of Dutch War
as quoted by Mahan

WHEN the curtain fell on the World War there were straightway heard the opening guns of a new conflict —a war on war. It is still in progress; and it will not end until the attainment of a satisfying approach to the avowed objective, the abolition of war, or until there begins the stampede to a new obsession that inevitably follows exhaustion of popular thought. It is not, as yet, a sanguinary war. Thus far it has only mangled reason.

The abolition of war, in a literal sense, must await the advent of a Burbank of humans who will modify human nature beyond present human conception—even if we dared to do away entirely with an agency to which civilization owes many of its greatest advances. Nevertheless, reduction in the number of preventable wars, prolongation of peace intervals, some lessening of the awful sacrifices of life and property in unprofitable conflict—these are within the range of possibilities and constitute a goal worthy of the best of human thought and human ability.

For once no civilized government can hestitate, openly at least, to engage with the right. For once no right-thinking individual can be hampered by doubt as to which side he shall espouse. For once the forces of man's intellect are yoked to a common cause, are aligned against the forces of human nature and the entanglement of human circumstance in a Titanic struggle to achieve world harmony.

The history of this movement to end war, throughout the twelve years which have elapsed since it began, is not particularly encouraging. One may lay his finger upon few spots on the globe where governments are entirely uninfluenced by fear, where there is no real or imagined menace from a neighbor, where there are no real or imagined conditions which at any moment might well become a cause of war. After struggling a dozen years to end war, we find ourselves today anticipating war in a dozen countries and estimating the risks of becoming involved should our anticipations be realized.

President Wilson proposed to perpetuate world harmony through the agency of a League of Nations; President Harding invited the nations to an armament limitation conference in Washington and signed the treaties resulting from that conference; other nations inaugurated, and we have flirted with, a World Court for the adjudication of controversies which bear the seeds of war; Secretary Kellogg of the Coolidge administration successfully initiated the treaties bearing his name which specificially renounce war as an instrument for the settlement of disputes; the London conference constitutes the contribution of President Hoover's administration and resulted in the limitation of those naval types not limited by the Washington conference.

We declined membership in the league because we saw in it a possible obligation to participate in concerted action against outlaw members. Our first experience with armament limitation resulted in renunciation of our naval base opportunities in the western Pacific; in the limitation of battleships —in which we were at the time actually or potentially predominant; and immediate involvement in a new building competition in all types other than battleships. We voted to join the World Court but imposed reservations which nullified our action. We are committed to the Kellogg treaties, but the wildest optimist can rate their significance

BATTERY IN ACTION AT THE FRONT

Courtesy Commander J. W. Bantley, U. S. Navy

no higher than a *beau geste* of intentions comparable to a policy announcement by corporation directors bound by ethics and the law to give first consideration to the interests of their stockholders. Limitation of naval armaments is now complete as to types included. It remains to be seen whether we will build to treaty limits or be satisfied with the paper right to build.

Consideration of this record of operations of the war on war—in conjunction with popular sentiment as reflected in the press, in current literature, and in our legislative halls—leads to the conviction that the point of attack selected by the anti-war army is not the roots and causes of war, but national defense.

The cause we are engaged in, reduction of the tribute in human wealth and human lives exacted by war, is too big, too important to civilization, to be jeopardized by ignorant direction. It deserves and should receive the most careful study of our best qualified minds. If, after thorough consideration, it develops that the best chance of abolishing war lies in destruction of armament, we should proceed with the work of destruction. If, on the other hand, intelligent study results in the conviction that destruction of armament alone cannot accomplish the objective, then it would be the part of wisdom to adopt other plans of operation.

The question suggests itself: Have we made an intelligent study of the *causes* of war with the object of discovering a rational procedure for the *avoidance* of war? Can it be said that any of the steps taken or contemplated thus far amount to more than a blind attempt to cure the disease by treating the symptoms?

Unfortunately, there prevails a widespread impression that wars are caused by great armies and powerful fleets; that efficient weapons incline their possessor to seek occasions for their use. The idea is based upon a trait of human nature which is shared by all men in the direct ratio of their individual stupidity. It may, nevertheless, be true; but it cannot be used as a safe working hypothesis until it be definitely established as true. We cannot risk the success of a great movement upon an assumption.

On the other hand, there is much to support the belief that beneath the apparent causes of war, beneath consciousness of power, beneath national antipathies and religion and imperialistic ambition and the thousand and one excuses for war that, like the assassination of Austria's archduke, apply the torch to the tinder of circumstances, there lie other and basic causes which, in accord with a law as yet dimly recognized, make war as inevitable under given conditions as the spark between poles of differing potentials. And there is at least a justifiable suspicion that these are reducible in the last analysis to a single cause, a *one cause* for *all wars*.

Before the day of Herodotus, when the great Mesopotamian empires were in the heyday of their glory, numerous human satisfactions beyond the needs for home consumption were produced in China. This surplus production was brought by camel trains to Persian or Indian frontiers and there exchanged for the surplus production of the valley of the Euphrates and Tigris. Thus trade came into being. At first this trade was conducted purely on the basis of commodity exchange. The invention of money followed the natural demand for a portable medium of exchange and two still unsolved problems began for the first time to occupy attention—the balance of trade and the travel of gold. With the use of money and its accumulation came, too, the inevitable phenomenon of change in national character from martial to commercial mindedness.

By degrees this thing we call trade, this machinery for the exchange of commodities, grew into an octopus whose tentacles overreached boundaries, traversed seas, surmounted mountain barriers, conquered deserts, overcame differences in language and thought, until today it controls and energizes the world.

Early in the development of trade there came into being great trade centers or money capitals, wherein exchanges were consummated and wealth accumulated. And in every age there has existed one such center, greater than others, which may be said to have controlled exchange and directed the movement of money. From period to period, from age to age, the site of the money capital has shifted—or remained stationary—in accordance with economic law. Tadmor, Palmyra, Damascus, Antioch, were money capitals in the dawn of history. From Antioch it moved to Tyre, from Tyre to Athens, from Athens, by design of the

conquerer, to Alexandria, thence to Carthage, thence to Rome.

With the softening of the Roman character, induced by the luxuries made possible by conquered wealth, and the consequent transition from martial to commercial mindedness, Roman production declined, wealth flowed to creditor nations, money became scarce, prices rose, and the money capital transferred its seat to Byzantium. The same conditions again developed the same destructive tendencies. Fattened by luxurious living, warlike spirit withered and died, and the glory of Byzantium became a memory.

The general adoption of sails and the improvements effected in ship design brought Venice and Genoa into dominant positions. The Crusades, born of religious zeal but conceived in trade necessities, reopened inland routes long neglected because of brigandage, and the fairs of Champagne became for a time the centers of exchange. With the coming into general use of the mariner's compass, an all-water route from the Levant to the west coast of Europe brought the scepter of trade to Antwerp. England, with her sea power and her strategic position on the ocean flank, wrested trade dominance from the Dutch and, for nearly four centuries, London maintained her title to the seat of money rule. Indications are not wholly lacking that, following its ever westward course, it is now by way of migrating to the New World.

It made for wealth, this great movement of exchange—silks from China; carpets and rugs from Persia; moonstones and frankincense from Arabia; drugs, pearls, spices, ivory, and precious stones from India, the Spice Islands, and the Malay Archipelago. It was these coveted satisfactions, borne westward by endless caravans to be traded at some Phoenician port for hides and oil and wine and linen and pottery—in turn transported eastward in deep-laden triremes from Roman colonies, the Scilly Isles, far Cornwall, Greece, and other Mediterranean countries—that spread cultures and shifted boundaries. It was the economic necessity for each participating country to extend its spheres of influence by colonization, to control trade routes and centers of exchange, to secure for itself a larger share of the benefits of commerce, that bred clashes of interests and resulted in wars.

It was to seek the wealth of which trade informed him that Xerxes attempted the invasion of Greece. It was to control the sources of eastern wealth that Alexander conquered the world. It was to free itself from the trade supremacy of Athens and gain the privilege of trading with Athenian colonies in the Aegean, barred by Athenian trade regulations, that Sparta fought the Peloponnesian War. It was Carthaginian commercial supremacy that brought about the Punic Wars and laid the foundation of the Roman Empire. It was lust for power that caused the wars of history; and the power coveted was the power of wealth which came through monopolistic trade.

There are two inescapable deductions to be drawn from the chronicles of trade. First, that the possession of wealth tends inevitably to loss of martial spirit; and, second, that the movements of money control have ever been attended by conflict. The decline of the martial spirit in national character has been the precursor of decline in the history of every empire; loss of money control and direction has ever marked the actual beginning of decline.

The more one studies the story of trade and the movements of money; the more one dissects the tangled skeins of religious, political, national antipathies—which, like nerve ganglia, overlie the vital organ of trade—the more one is inclined to the opinion that all wars have their roots in economic considerations. In other words, that wars are born of the *will to live*.

Trade is competition. Trade between nations is mimic war. Trade is without bowels of compassion, without governing ethics, without morals. A nation's trade flourishes or languishes according to the degree of aggressiveness or apathy it displays in the maintenance and extension of its spheres of influence—and trade can neither be maintained nor extended without affecting the interests of other nations and increasing the opportunities for conflict.

Before the development of modern banking systems trade necessitated colonies; and colonization, which from the sixteenth to the nineteenth centuries wrote the most inspiring pages of history, gave rise to new clashes of interest and new conflicts. Maritime trade with other nations and with colonies meant shipping. Shipping and colonies required protection. Retention of colonies in-

volved the power to protect; extension of colonies involved the power to acquire. Navies came into being as a necessary adjunct to empire and as a vital need in a nation's life.

An English writer, Jeudwine, quoting an unmentioned author, thus states the proposition:

> The trade to be drawn from a country . . . is the only reason for the acquisition of territory for empire. . . . Can it be a profitable market for manufactures or a home for our increase of race? . . . One of the lessons of empire is that attempted monopoly of trade, *which has been at the bottom of almost all great wars,* means that the nation asserting the monopoly must be prepared to defend its assertion by force against the world.

Obviously the proposition is not complete without the corollary: *As long as there remains one nation in the world which might aspire to monopoly and possesses the force to back its aspiration, just so long must other nations maintain the power to resist.*

From this line of reasoning it follows that failure to maintain adequate power of defense not only jeopardizes a nation's foreign commerce and weakens a nation's influence in the spheres wherein it trades, but actually invites war through the temptation its defenseless position offers to a strong aggressor. Or, to put it differently, in this war we are waging on war, an attack directed against our national defense not only results in no immediate damage to the enemy but reduces our chances for ultimate success. We could not adopt a better line of strategy were we fighting to perpetuate war!

The need for navies developed from trade. The naval branch of a nation's military defense has ever been the handmaiden of commerce. It extends the knowledge of and the respect for a nation's flag; it keeps open the lanes of sea trade; by its mere existence it prevents the culmination of disputes which otherwise might furnish cause for conflict; it protects a nation's citizens by peaceful means and breeds diplomatic courtesy and consideration; it constitutes the only practical insurance against aggression and discourages those who advantage themselves at the expense of the weak. Obviously, the strength of a nation's navy should be limited by its own peculiar requirements—not, like a sailorman's uniform, cut on the pattern of others. It should be determined by the nation's fixed policies, by the amount and geographical extent of its foreign trade, by the length and character of its coast line, by its position among the family of nations. Too great, it involves unjustified expense and arouses suspicion of its country's intentions. It becomes an element of danger. Too small, it constitutes a positive menace to harmony. It is no less important to the peace and well-being of other nations for a country to maintain adequate power of defense and commerce patrol than it is to the country itself, since failure to do so tends to weaken the aggregate power for good of well-intentioned groups.

Borrowing from the language of the behaviorists, if certain stimuli produced certain responses in the past history of man, similar stimuli may be expected to produce similar responses in man of today. With respect to trade and the conflicts which follow wherever trade penetrates, human nature has changed no whit since the Venetians, to make opportunity for the sack of Constantinople, diverted the Crusaders from the road to Jerusalem. The governments of nations are still great business machines and their business is foreign trade. With growth in population and the increasing difficulty of life in an increasingly competitive age, rivalry is even keener today than in the past; and consideration for the weak is a sentiment more and more confined to individuals. Talk of ending war by the simple expedient of lying on our backs and exposing our abdomens, is an approach to the intellectual level of the puppy that knows no other way of propitiating a potential enemy.

And yet, while the probabilities of ending war are exceedingly remote, no man can say that it is impossible. Surely an appreciable reduction in the number of wars, useless, unprofitable wars, is within the range of possibility. Surely it is an objective worthy of the best of human endeavor. This much, however, may be definitely asserted: Hope for accomplishment lies in but one procedure—*attacking the roots and basic causes of war.*

Leagues of nations, world courts, limitation of armament conventions, if wisely designed and faithfully adhered to, may prove of assistance in the promotion of peace and the prolongation of peace intervals, but their full usefulness must come *after,* and not *before,* we have made a thorough study of the etymology of war and have developed a sys-

tem of therapeutics for the scientific treatment of war as an economic disease.

To borrow again from the terminology of the behaviorists, is it not at least possible to "condition" the responses of human nature to new and different stimuli of trade necessities?

Wars grew out of trade and out of the tradition that trade is the civilized offspring of barbarous robbery. May it not be that the necessity for trade wars and the justification for the tradition belong to an era that is finished? May it not be that the customary time divisions of the historians call for revision? That we have now emerged from the Age of Exploitation and stand on the threshold of the Age of Stabilization? The Age of Discovery, the Age of Colonization, the Age of Exploitation are all of the past. The World War marked the ending of the old epoch; the existing economic depression may well be the first shadow cast by the coming event of world economic unity, wherein we shall be done with conquest and shall no longer concern ourselves with expansion of political boundaries, wherein the technique of robbery must give way to the technique of coöperation in a world that has changed.

At the beginning of this new era, the nations of the earth must pause and consider. They must choose between the age-worn trail of competition and conflict, or the as yet untried path to coöperative trade control and concord. They must choose if the history of the future will continue to chronicle the struggles for empire which have drenched humanity with blood since Alexander first coveted the trade wealth of India; or will record an epochal advance in human thought through recognition of the principle that *prosperity of the unit depends upon the prosperity of the whole.* In this day of modern communication facilities, the once limitless world of Homer has dwindled to the size of Homer's Greece. The Magellan expedition circumnavigated a globe in three years which the *Graf Zeppelin* negotiated in as many weeks. Andrew Jackson fought the battle of New Orleans a month after peace was established between England and the United States, while an anxious world heard the last gun of the World War before its echoes died in the trenches. A few decades ago the Argentine rancher was but faintly interested in months-old news of important happenings in New York; today he plans his business operations upon daily quotations of a world's meat market.

No longer do we, as individuals, stand isolated and independent in our private occupations; and, by the same token, no longer do nations walk alone in self-sufficiency. Elbows touch elbows; interests impinge—and accord or clash—upon the interests of others. A law passed or a policy adopted by one nation affects, for good or ill, all other nations. No individual can live alone; and no nation is entirely sufficient unto itself.

That realization of changed world conditions, and the need for a world-scale direction of commodity production and distribution, is beginning to dawn on the mass mind, is indicated by the various conferences held in recent years or planned for the immediate future. A short time ago the President of France proposed an economic federation of Europe. In the fall of last year there was organized in Sacramento a pan-American institute of reciprocal trade which is now perfecting a machinery for bringing into closer relations the trade interests of the Americas. In December of the past year there convened in Geneva an international economic conference for the purpose of getting at the roots of the existing business depression. A few weeks later, agricultural experts from throughout the world met in Rome, at the instance of the International Institute of Agriculture, for the study of the agricultural situation in Europe. Early in January of the present year, a similar conference was scheduled at which representatives from Canada, Argentina, Australia, and the United States reviewed the crises in those countries. Later in the same month, the agricultural experts of the League of Nation's economic committee assembled in Geneva to decide upon direct action. All over the globe one hears the rustling of a new movement, born of a new idea—the oneness of the world.

From such beginnings there may come accomplishment; but, unless mass thought can be made to grasp the new idea, progress must follow the slow and tedious processes of evolution. Is it not time for a frank avowal of intention to divorce world economics from the fear-breeding question of world politics and to initiate a world advisory and directing body for trade alone? Is it not time to undertake a scientific

study of world production; of the suitability of present territorial production; of the possibilities of, and practical results to be expected from, controlled distribution; of trade barriers as affecting ideal distribution; of the feasibility of adopting uniform weights and measures and quality standards and monetary systems? Does not such procedure offer the best promise of an ultimate business partnership of nations which, alone, can hope to eliminate the frictions of trade, increase the efficiency of trade, and render more remote the chances of trade conflict?

In short, would not such procedure constitute a better strategy for our war on war than that based upon the false hypothesis that the crippling of national defense is a prerequisite to the establishment of peace?

The trouble with our present plan of operations, in our fight to end war, the inherent defects of the League of Nations, the World Court, armament limitation by agreement, and renunciation of war treaties, lies in their susceptibility to political intrigue, in their inclusion of such delicate questions as the sovereign right to self-determination in the matter of engaging in war, and the impossibility of excluding the insidious influences of self-interest.

Political internationalism is as yet unthinkable. Economic internationalism, under the changed world conditions, is rapidly being recognized as a necessity. Let us look facts squarely in the face. Let us not invent mild sounding terms for our discussion of world problems. Let us frankly admit that we—of the United States of America, of England, of Germany, of France, of Italy, of Japan, of any other country—hold a certain desirable portion of the earth's surface and resources, and intend to continue holding it for ourselves and our children.

But, is it not possible, with full regard for political sovereignty, to accept the new view that world business is a unity best managed by unified direction, that our individual countries are branch houses of that super-business, operating under our immediate control—all working in harness together on the principle that only through prosperity of the parent company can the subsidiaries hope to prosper? Cannot this be brought about, not only for sound business reasons, but, for the sake of our great objective, peace? Is it not possible to educate the rank and file of our forces in this war on war, to focus attention upon its true mission, to the end that humans of every race and color and language may have the opportunity to live and work and prosper in a peaceful, friendly world?

In a campaign of education, as in a military campaign, an estimate of the situation is a prime essential to success. The group to be educated must be scrutinized, must be divided into sub-groups—those who can be brought into the ways of right thinking and those who cannot or will not. Efforts should be confined to the first division and a plan of procedure devised.

Throughout the length and breadth of our land, possibly in other lands as well, countless minds are at this moment engaged in the effort to weld public opinion into the shackles that will restrain the American Congress from authorizing the treaty navy. Numerous powerful groups operating under the cloak of humanitarianism; not a few great religious organizations whose tentacles reach into every community and affect the political fortunes of every congressman and every senator; business elements interested in maintaining at any cost the low level of taxes; and a vast multitude of well-intentioned men and women—self-ordained physicians for the cure of what they deem a moral disease; are busily campaigning for the curtailment of naval expenditures on the mistaken theory that military preparedness makes for war.

Of the motives inspiring this more or less organized attack upon our national defense, a not inconsiderable part is born of selfish interests. Sophisticated commercial rivals, case-hardened by more centuries of Old World experience than our New World democracy can count in decades, smile at our adolescent ideas of universal peace and the brotherhood of man, and, at the same time, exploit our simple faith for their own ends. The composite American business mind values present advantage above future security and can see no profit in national insurance in times of general peace. Commercial rivals who would maintain their own naval supremacy by the inexpensive method of inducing us to withdraw from the race, the business man who cannot see beyond his limited horizon, and the political opportunist who measures the soundness of a cause by his estimate of its popularity, these we shall

always have with us, working and voting in accord with what they deem their interests.

But by far the larger part of the anti-national-defense branch of the anti-war army is made up of earnest individuals striving to a worthy end. If the efforts of these be based upon clear understanding and sound thought, they may accomplish much for humanity. If they be based upon unsound thought, if these moral healers be ignorant of the very nature of the disease they seek to cure, then the effort they expend is misdirected effort and must result in positive injury to their country and, in the end, to that world society which they have idealized beyond all semblance to fact.

Knowing the element that can be educated, that plan for the indoctrination of the forces against war should be chosen which offers the surest and quickest results. There is but one appeal more compelling to human nature than that pure idealism which it does not itself possess, and that is business advantage. Obviously then, education of the American peoples on the true nature of war should be undertaken through the channels of business interests.

The thesis we would defend may be summarized thus: (a) the only hope of lessening the frequency of wars is by attacking the roots and causes of wars; (b) the roots and causes of wars lie in economic considerations—trade; (c) trade, in the Age of Exploitation, just finished, necessarily bred clashes of interest, hence conflict; in this Age of Stabilization trade can be profitably conducted only on a basis of world coöperation and world concord. If these propositions be true, it follows that the fight against war should resolve itself into a fight for economic internationalism—not for the curtailment of national defense.

To secure popular acceptance of the thesis, the popular mind must be approached through its pocketbook. It must be led to see that the only course for the attainment of world harmony is also the only course for the cure of surplus production, under-marketing, and the rest of the train of economic ills that plague it today.

When this is accomplished, then, instead of attacking national defense, instead of seeking such rainbow gold as the abolition of war by legislation, instead of dreaming dreams of peace by coöperative police restraint upon the war inclined, instead of devising world forums as arenas for the bloodless but not always harmless battles of lawyers, instead of all the misdirected efforts of good men and good women whose hearts are bigger than their minds, we shall begin at the very foundation and rebuild trade on a new concept.

It may even be that this new trade itself will develop into an agency for the attainment of at least a human approach to the *just allocation of world resources and world opportunity*, humanity's only hope for the establishment of stable world prosperity, universal peace, and good will.

WATER LOSSES FROM SUBMARINE STORAGE BATTERIES

By Lieutenant John F. Madden, U. S. Navy

THE purpose of this article is to set down certain observed facts regarding the loss of water and electrolyte from the individual cells of submarine storage batteries. It is not intended to advance any new theories or hypotheses with regard to these losses. Excessive water losses from submarine installations have existed for years, but the causes of these losses have remained unchanged although certain fundamental facts have become established.

The fact that any *wet* secondary cell loses water is a matter of common knowledge. To submarine personnel it is a matter of constant annoyance. In the past the need of watering batteries periodically has been accepted, by submarine crews, as one of the necessary hardships peculiar to that engaging pastime known as submarine life. The task of watering a submarine's batteries is not one that may be arbitrarily delayed or undertaken at one's leisure. It requires from three to five hours. On all submarines except the larger V's, it requires lifting about 60 per cent of the free deck space in the boat interior. This obstructs traffic, interferes with the proper conduct of other ship's work and more or less upsets the daily routine. In addition it has a most unfavorable effect on the tempers of such gentry as the captain, the chief-of-the-boat, and the ship's cook. It is a thoroughly unpleasant task. In peace time it remains as something which has to be done and is accepted as such. In war time it assumes a much more serious significance.

Consider an S boat conducting a war-time patrol. To begin with, the boat must carry aboard sufficient battery water to provide for at least two complete waterings. On the S-class this means about two tons dead weight. The boat will, in all probability, be submerged all day and may have to conduct several submerged attacks during this time. This means charging batteries every night. Under these conditions ten days is considered a liberal period to expect between waterings. On such occasions three to five hours must be subtracted from the surface period at night during which time the batteries may not be charged and any other ship's work is seriously hampered. The watering might be accomplished during the daytime, submerged, it is true. However, the resulting confusion and difficulty in controlling the boat submerged would be sufficient to cause a prudent commanding officer to avoid this except under exceptional circumstances. This would be particularly true if there were any possibility of making contact with the enemy. Couple all this with the weight of the evaporating plant, which is installed primarily to provide battery water, and you have a formidable problem.

From the above it may be deduced that the necessity for watering batteries imposes the following handicaps on a submarine: (a) reduces the military effectiveness by say one torpedo; (b) restricts its mobility; (c) imposes a definite task on the crew which, in war time, might become a factor of some importance.

The above discussion would seem to provide a substantial foundation for conducting an investigation into these water losses and their causes; although another cause actually brought the matter under observation. The Bureau of Engineering has steadily applied itself and its resources to eliminate the danger of battery explosions aboard submarines. Under its supervision various tests, investigations, and experiments were undertaken, for the most part, at the Naval Research Laboratory at Bellevue, D.C. As the work on explosion hazard progressed the importance of the question of water loss became more and more apparent. Investigations were, accordingly, undertaken. Shipboard tests were conducted on two submarines sent to Bellevue for that special pur-

pose. Additional work has been done at the Submarine Base, New London, Connecticut. As a result of this activity, a clearer understanding of water losses and their causes has been arrived at.

Theoretically, water and electrolyte leave the cell due to the following causes:

(a) *Loss due to gassing.*—Gas is formed due to the excess charging current causing an electrolysis of the electrolyte. The gas so formed is carried out of the cell by the ventilating system.

(b) *Loss due to evaporation.*—There is neither the time nor space to quarrel over the correctness of the designation of this cause. Simply it is intended to mean that the relatively dry air of the ventilating system, passing over the electrolyte surface picks up moisture and carries it out of the cell.

(c) *Loss due to mechanical sweeping out.*—This loss is caused by the high velocity of the ventilating air. It is a process difficult to describe but is at once apparent when it can be seen. Tests conducted on the experimental cell at Bellevue have shown that gas bubbles, forming on the cell plates, detach themselves and rise rapidly to the surface of the electrolyte. On reaching the surface they have acquired considerable velocity under the action of which they forcibly break through the surface and are projected upward into the air space above. By air space is meant the space between the cell cover and the surface of the electrolyte. It has been determined that in breaking through the electrolyte surface each gas bubble becomes enclosed in a coating of electrolyte. The bubble, with its coating of moisture, is projected upward into the rapidly moving air stream and is mechanically swept out of the cell.

These then are the three fundamental causes of water loss. Let us inspect them again with more attention to detail. A little study will show at once that all causes are in their most aggravated form when the cell is charging at the finishing rate. This may be briefly summarized as follows:

Gas.—The greatest evolution of gas in the cell occurs during the finishing rate of a charge. Hence, the greatest loss due to gassing exists at this time.

Evaporation.—During the finishing rate all the ventilating blowers are being run at full speed. In other words a much greater volume of dry air is being swept over the electrolyte than at any other time. More dry air; more evaporation. In addition the surface of the electrolyte is considerably agitated, at this time, due to the high evolution of gas. Further the electrolyte is warmer due to the heating effect of the charge. Both of these factors assist evaporation.

Mechanical loss.—As the greatest number of gas bubbles are emitted during the finishing rate then the greatest number of electrolyte coated droplets are being projected into the air space during this period. In addition the ventilating air is moving at its highest linear speed due to the running of the blowers at full speed. Hence the "sweeping out" effect is more pronounced during this time than at any other.

From the above, then, it seems reasonable to expect that the greatest loss of water will take place during the finishing rate of a charge. To reduce it a little further, water losses in service should be at a maximum under the following conditions: (a) repeated charging; (b) when "floating" a fully charged or nearly fully charged battery on the line; (c) during overcharges and equalizing charges.

It is considered that these findings are fully substantiated by service experience. It is a well known fact, among submarine people, that an idle battery loses little water. Lying alongside a dock or tender, putting in a routine charge now and then, takes little water from the cells. But under operating conditions requiring a charge every night, "floating" when under way to keep the wheels from racing, then the water disappears truly like "water." There is nothing new or novel about all this; it is something which has been a matter of service knowledge for a good many years.

From the above it may be said, with reasonable accuracy, that it is now rather definitely understood what is causing the loss of water from the cells. Having arrived at this understanding there remains the question as to what can be done to either eliminate or control these losses.

Most submarine personnel are, by this time, familiar with the glass plate which has been authorized for installation in submarine cells. For those who are not it will suffice to say that it consists of an oblong sheet of ordinary window glass about one-eighth of an inch thick. This plate rests on

top of the cell plates, in a horizontal position and covers the whole area between the negative and positive terminals. In this position it is submerged about two inches below the normal electrolyte level. It thus covers almost completely the central area through which the gas bubbles find their way to the surface of the electrolyte. The presence of this plate alone should cause a considerable reduction in water loss. Its action with regard to the three fundamental causes of water losses may be described as follows:

Gas.—Gas bubbles form, as before, and proceed upward until they strike the under surface of the glass plate. Here their progress is arrested and their velocity reduced to zero. Several small bubbles then form into one large bubble which, finding its way to one of the edges of the glass plate, slips around the edge and proceeds upward to the surface of the electrolyte. During the period of this final ascent, however, the bubble acquires little velocity. Hence it is not projected as violently through the surface nor as far into the air space above. In addition instead of a myriad of small bubbles we have many larger bubbles, all coming to the surface at the sides of the cell rather than over the entire electrolyte surface. This description has been entered into here merely to picture the course of the gas bubbles in the cell interior. The glass plate provides no reduction in water loss through gassing. The same amount of gas is being evolved, as previously, and finding its way into the air space is carried out of the cell as before.

Evaporation.—As described above, the bubbles break through the electrolyte surface around the edges of the plate and at the sides of the cell jar. The surface of the electrolyte over the entire central area remains placid and unbroken. This unbroken surface is directly under the path of the ventilating air stream and is, hence, where most of the previous evaporation took place. But whereas before this surface was agitated and so with considerable moisture laden air above it, now it is smooth and unbroken. This fact alone seems to have materially reduced the loss from evaporation. There is still some evaporation taking place, without question; but not in the quantities previously experienced. So, by the use of the glass plate, we have caused some reduction in the water loss due to evaporation.

Mechanical loss.—The velocity of the gas bubbles breaking through the electrolyte surface is materially reduced below that experienced without the glass plate. Secondly, there are not nearly so many of them. Finally they are not projected directly into the path of the rapidly moving air stream of the ventilating system. These several features seem to have caused an almost complete elimination of water loss due to coated droplets being mechanically swept out of the cell.

In summary, then, the glass plate has the following effect on the three basic causes of water losses: gas, none; evaporation, partial reduction; mechanical loss, almost complete elimination.

Just how pronounced the over-all reduction in water losses will be due to the installation of glass plates remains for service test to demonstrate. However, it is hoped that their adoption will prove to be the first step on the pathway of improvement, which leads to the broad highway of progress. A great deal remains to be done on the complete question of water losses. There is the matter of how far water loss from a cell may be reduced without running into difficulty due to high cell temperatures. The baffle discs now installed in the cell goosenecks have come under a severe fire of criticism. One suggested substitute employs the principle of a water separator in a steam line. In other words by reversing the direction of flow of the ventilating air, one or more times, any entrained moisture is trapped out and may be drained back into the cell. This device not only recovers water from the air stream but reduces the resistance to air flow experienced with a baffle installation. If it brought no other benefit the adoption of such a device would be acceptable on the grounds that it would close forever the question of how many baffles should be placed in each individual gooseneck. It will, in all probability, meet with opposition from the battery people both ashore and afloat. They would have nothing left to fight about. The sun may still rise on the day, however, when the electrical gang can stow their gear, after watering, with the knowledge that the job is done for at least three or four months.

Here, it is hoped, is a message of cheer for those who still dwell in darkness. Although in the dawning of this coming day of relief one seems to hear the voices of the oppressed chanting their age old battle cry—"Hell, it ain't no job to water batteries. We used to do it in an hour on the B boats."

INTERNATIONAL HYDROGRAPHIC BUREAU

By Rear Admiral A. T. Long, U. S. Navy (Retired)

ON JANUARY 14, 1931, the International Hydrographic Bureau was installed, with appropriate ceremony, in a handsome and very suitable building on the Quai de Plaisance, Monaco, by H.S.H. Prince Louis II of Monaco, accompanied by the Hereditary Princess and the Minister of State.

H.S.H. the Prince of Monaco offered in 1927 to build this building especially for the bureau, and adapted to its use, with the sole obligation on the part of the bureau that it would be its seat for not less than twenty-five years. This very gracious offer was accepted by the state members of the bureau, and in April, 1929, the corner stone of this building was laid with appropriate ceremony, in the presence of the delegates to the first supplementary international hydrographic conference, then in session.

At the international marine conference held in St. Petersburg in the year 1912, Ingénieur-Hydrographe Général Renaud, director of the hydrographic service of the French Navy, suggested the calling of an international hydrographic conference, and the formation of a permanent bureau to advance the science of hydrography and to aid in the coördination of the work of the hydrographic services of the different nations.

Owing to the World War nothing further was accomplished in this direction until 1919. However, the World War demonstrated most profoundly and practically to the Allies the necessity of increasing such coöperation for the benefit of all seafaring nations. Therefore, in 1919 Monsieur Renaud, director of the hydrographic service of the French Navy, and Rear Admiral Sir John F. Parry, hydrographer of the British Navy, took steps to bring about such a conference, with the result that the first international hydrographic conference met in London in 1919, at the invitation of the British Admiralty. Twenty-four of the principal maritime nations were represented at this conference, and, among other things, it was agreed to establish a permanent international hydrographic bureau, and a subcommittee was appointed to draw up draft statutes and organization for the permanent bureau.

The United States took part in this conference having as its delegates Captain Edward Simpson, hydrographer of the Navy; Mr. G. W. Littlehales, hydrographic engineer; Mr. H. C. Graves, chief of hydrographical division of Coast and Geodetic Survey; Mr. J. T. Watkins, chief of field records section of Coast and Geodetic Survey. Captain Simpson was a member of the subcommittee, but, upon his promotion to rear admiral and being ordered to sea, Rear Admiral A. P. Niblack of the United States Navy, took his place on that committee.

In 1921 the International Hydrographic Bureau was created and established its seat at Monaco. The following governments of maritime states became members:

Argentina	Japan
Belgium	Monaco
Brazil	Netherlands
Great Britain and Australia	Norway
Chili	Peru
China	Portugal
Denmark	Siam
Egypt	Spain
France	Sweden
Greece	United States of America
Italy	

The principality of Monaco was selected as the seat of the bureau largely because of its neutrality, its position on the sea, its central location, and also because of the interest taken in such matters by the late Prince Albert of Monaco, who was an outstanding figure in all questions on oceanography.

The bureau having been established after the treaty of Versailles, and the majority of the members being members of the League of Nations, it was necessary, as well as desirable, for the bureau to be affiliated with the league, but it is completely and entirely autonomous.

Under the statutes of the bureau its work was to be conducted by a directing commit-

tee, consisting of three directors and a secretary general, assisted by a staff of technical assistants. The first directing committee consisted of:

President—Admiral Sir John F. Parry, K.C.B. (Great Britain).

Members—Rear Admiral J. M. Phaff (Netherlands), Captain S. H. Müller (Norway).

Secretary General—Commander G. B. Spicer-Simson, D.S.O. (Great Britain).

Had it not been for the unfortunate death of Monsieur Renaud, who was a renowned hydrographer, he would undoubtedly have been selected as a member of the first directing committee. The president is the director who receives the highest number of votes.

The United States did not have a candidate at the first election as she had not yet confirmed her membership. However, upon the resignation of Captain S. H. Müller, Norway, on account of advancing age and infirm health, Rear Admiral A. P. Niblack, U. S. Navy, was elected in April, 1924, to fill that vacancy.

Rear Admiral Sir John F. Parry died in April, 1926, and Rear Admiral J. M. Phaff, Netherlands, in accordance with the statutes, assumed the presidency, but no election was held to fill the vacancy thus caused as the new election, under the statutes, was to be held at the second international conference which would meet in November, 1926.

At that conference the second directing committee was elected as follows:

President—Rear Admiral A. P. Niblack (United States).

Members—Ingénieur Hydrographe Général P. de Vanssay de Blavous (France), Captain L. Tonta (Italy).

Secretary General—Commander G. B. Spicer Simson, D.S.O. (Great Britain) re-elected.

Vice-Admiral J. M. Phaff was not a candidate for re-election.

Rear-Admiral A. P. Niblack died in August, 1929, and, in accordance with the statutes, Ingénieur Hydrographe Général P. de Vanssay de Blavous (France) became the president of the directing committee. An election was held by mail to fill the vacancy, and Rear Admiral Andrew T. Long, U. S. Navy, was elected in May, 1930; the directing committee now consists of:

President—Ingénieur Hydrographe Général P. de Vanssay de Blavous (France).

Members—Captain L. Tonta (Italy), Rear Admiral Andrew T. Long (United States).

Secretary General—Commander G. B. Spicer-Simson, D.S.O. (Great Britain).

It will thus be seen that the United States has been deeply interested in the bureau from its inception, and is represented at the conferences by delegates from the Hydrographic Office, Navy Department, and from the United States Coast and Geodetic Survey.

The bureau is supported by member states by yearly contributions based on each state's total combined merchant and man-o'-war tonnage. Each country has a certain number of votes, which, also, is based on this combined merchant and man-o'-war tonnage. There are now twenty-two member nations, viz:

Argentina	Japan
Brazil	Monaco
Great Britain and Australia	Netherlands
	Norway
Chili	Peru
China	Poland
Denmark	Portugal
Egypt	Siam
France	Spain
Germany	Sweden
Greece	United States of America
Italy	

Under the statutes an international hydrographic conference must be held every five years. The next one will be in the spring of 1932. At these conferences matters pertaining to hydrography are discussed and agreements arrived at. Also the directing committee is elected for the next term of five years. No country may have more than one director, but may have a director and the secretary general. The directors and the secretary general are eligible for re-election.

The history of the creation of the International Hydrographic Bureau indicates clearly the objects of its work and may be summarized "to make navigation easier and safer."

Article 9(a.) of the statutes prescribes that the principal work to be undertaken by the bureau is the following:

(1) The study of documents published by hydrographic offices;

(2) The drawing up and publication of various lists, such as of geographical positions, abbreviations, and conventional signs used on charts, etc.;

(3) The study of methods of hydrographic surveying;

(4) The study of methods employed for the production of the results of surveys for publication;
(5) The study of the construction and use of hydrographic instruments and appliances;
(6) The study of the methods of recruiting and training personnel for surveying vessels and hydrographic offices;
(7) The making of researches on any other subject which affect hydrography.

Reports on the results of such studies and research, which appear to be of general interest, are published in French and English.

The bureau distributes any useful information it receives on the subject of surveys which have been carried out or publications which have been issued or are being prepared in hydrographic offices, whether such work be new or for the purpose of revision.

The following are the regular publications of the bureau.

Annual Report.—This contains a general report on the administration and work of the bureau.

Special Publications.—These publications are issued at irregular intervals and contain information which is likely to be of more than passing interest. Some of them contain tables which are of permanent interest.

Hydrographic Review.—The first number was issued in March, 1923, but in 1924 and thereafter this publication has been issued twice annually, in May and November, except in 1926 when one number only was issued (in July). Each number forms one volume. The contents are very varied and include articles by authors of many nationalities, dealing with nearly every aspect of hydrography and with many allied sciences insofar as they affect hydrography. It is an organ for free discussion and exchange of views between hydrographic surveyors and it contains a bibliography of hydrographic publications.

International Hydrographic Bulletin.—This publication is bilingual (English-French), and has been issued each month commencing in January, 1928. It contains information which may be important but is of ephemeral interest only.

Year-Book.—This, also, is bilingual (English-French), and is published annually, commencing in January, 1928. It gives the titles, addresses, etc., of hydrographers, a list of the surveying vessels with their tonnage, etc., for the whole world, so far as such information has been communicated to the bureau, besides other information of interest to seamen.

In addition to the above, the bureau has published:

Reports of Proceedings of the International Hydrographic Conferences: First Conference, London, 1919; Second Conference, Monaco, 1926; First Supplementary Conference, Monaco, 1929.

The Statutes of the International Hydrographic Bureau, 1926.

The bureau satisfies, as far as possible, all requests for information or advice in connection with hydrography addressed to it by a member, and gives considered opinions on all questions dealing with its work which are referred to it by conferences or by scientific institutions.

The bureau also studies matters pertaining to aërial navigation and charts, and methods of aërial surveying; and publishes various articles on matters relating thereto.

The bureau does not publish charts, but the state members send to the bureau copies of all original charts *issued* by them.

The bureau, also, is building up its library by collecting various publications relating to the subject of hydrography.

Paragraphs 7 and 8 of the statutes state:

7. (a) The bureau shall be a consultative body only, and shall have no authority whatsoever over the hydrographic offices of the members, which remain entirely independent, with complete liberty and initiative.
   (b) It shall never deal with any subject which involves questions of international policy.
8. The bureau shall keep itself in direct and close communication with the hydrographic and other scientific offices of the members. It may communicate with such offices of other states also, at its discretion.

In its work the bureau endeavors to coördinate and harmonize all matters pertaining to hydrography with the object of "making navigation easier and safer."

Since the aim of the bureau is to attempt to bring about uniformity in hydrographic documents and publications and in short to "make navigation safer and easier," it must keep in close touch with the manifold and increasing activities of the various hydrographic offices of the world. The constant improvement in apparatus and methods, new inventions and scientific discover-

ies which mark the progress of our civilization must be carefully followed insofar as they pertain to hydrography and navigation. For this reason the work of the bureau is manifold and varied.

Among the most interesting phases of the work recently undertaken by the bureau is the collation and plotting of the deep-sea soundings obtained the world over by all sorts of apparatus, including echo sounding. This is being done in order to keep the general bathymetric chart of the oceans up to date.

The bathymetric chart was originally drawn up, at the suggestion of the seventh international geographical congress held at Berlin (Germany) in 1899, by H.S.H. the Prince of Monaco. The first edition of this chart was communicated to the eighth congress at New York on September 13, 1904. Before drawing it up, however, Prince Albert I had taken the advice of a committee set up by the seventh congress to elaborate a terminology to be employed in describing the forms of the relief of the ocean bottom. This committee consisted of Baron von Richthofen, chairman, Professors Krummel, Petterson, Supan, and Thoulet, Doctors Hugh Robert Mill and Nansen, and Admiral Makaroff; and it met at Wiesbaden (Germany) in April, 1903. It was at this meeting that Prince Albert offered to draw the chart and meet all the expenses connected therewith. In 1912 a second and up-to-date edition was commenced, but it was not until 1930 that this was completed. Meanwhile, unfortunately, Prince Albert died and, though he had made provision for the completion of the second edition, no funds existed to carry on the valuable work. However, in April, 1929, the first supplementary international hydrographic conference decided that this should be done by the International Hydrographic Bureau.

Reports of these soundings are forwarded to the bureau by the various hydrographic offices and after these have been plotted on the plotting sheets they are frequently published in the *Bulletin*. The problem, however, is not as simple as it would appear at first sight.

In the case of soundings out of sight of land, where the vessel is dependent upon astronomical observations to obtain a fix, the geographical position of the given soundings may be considerably in error. This becomes readily apparent when the soundings obtained by different ships in the same locality are compared with each other. Discrepancies result which are irreconcilable due not only to errors in fixing the ship's position, but also, possibly to errors in the case of echo soundings resulting from the configuration of the ocean bed. Even where such soundings have been reported by surveying vessels or men-o'-war especially instructed to take such soundings, the results at times show discrepancies. Every effort should be made to fix the position of the sounding vessel with the greatest possible accuracy, in order to prepare suitable charts of the ocean giving complete records of soundings which shall be of real service to mariners.

The question of whether echo soundings should be plotted on the assumption of a standard velocity of sound in sea-water, agreed upon internationally, or whether each sounding should be corrected for the density (depth and temperature), as well as for the slope of the bottom is still open to discussion. At the last international hydrographic conference at Monaco, in 1929, the majority of the delegates were in favor of correcting the echo soundings "as far as possible" before entering them upon the charts. In any event, there are many important questions involved which must be solved and made the subject of international agreement amongst the various hydrographic offices, if the method of echo sounding is to be made a reliable means for checking the ship's position when out of sight of land.

Another important phase of the bureau's work is the publication and keeping up to date of the "List of Life-Saving Stations of the World." This was made necessary by the fact that in various countries these stations are maintained by different organizations, some of which are private and some under the supervision of government agencies. Since such private agencies do not, as a rule, publish reports of changes, etc., in the stations under their control, the work of collating this information and keeping it up to date must devolve upon an international organization which is capable of keeping in touch with the responsible agencies of the various countries in question. "The List of Life-Saving Stations of the World," published by the International Hydrographic

Bureau, is the sole authentic source of information regarding these stations throughout the world, since many of these stations are not indicated on the charts.

The use of original charts, instead of reprints by foreign nations, has long been held advisable, and one of the purposes of the bureau is to help realize this aim. Naturally, this could not be attempted unless the signs, symbols, and abbreviations on all charts the world over were standardized. This question has been discussed in detail in all of the international hydrographic conferences, and gradually more and more of the symbols in common use have been adopted by the various hydrographic offices. In order to facilitate this work in the conference and to prepare the documentation, the bureau has prepared synoptic tables showing the various symbols and abbreviations in use by the different countries. In spite of the desire of practically all of the hydrographic offices to conform to a standard set of signs and symbols universally adopted, the realization of this aim still lies in the distant future owing to the excessive cost of making changes on existing charts. The best which can be hoped under these conditions is that with the issue of new charts the symbols adopted at the conference will gradually be substituted for the old symbols where such changes are made necessary.

In line with this work the International Hydrographic Bureau also prepared synoptic tables showing the signs, symbols, and abbreviations in use by the various hydrographic offices which publish charts for aërial navigation. This work was initiated in the early years of aërial navigation before many nations had started the publication of such aërial charts. In consequence, the great multiplicity of symbols which were in use by the various nations on marine charts, had not come into being. This synoptic table was then turned over to the international congress on aërial navigation, where it was made a basis of study by the delegates to the last convention on aërial navigation. Fortunately, only a few hydrographic offices had started the publication of such coastal charts for aërial navigation and there is, therefore, great hopes of early standardization, which will obviate the confusion which prevailed with the multiplicity of symbols formerly in use on marine charts.

In order to fulfill its mission the International Hydrographic Bureau is required in the nature of things to keep in close touch with other international organizations and societies which deal with matters pertaining to navigation, oceanography, hydrography, meteorology, surveying, etc. In this connection the bureau prepared and published a synoptic study of the systems of buoyage, storm, and port signals, thus bringing out their extreme variety which is such a great inconvenience and source of confusion to seamen. Here again, in spite of numerous international conferences held for the purpose, uniformity was found to be difficult, if not impossible of realization, at least in the immediate future. One of the greatest hindrances to the adoption of a uniform system lies in the fact that in several important countries the buoyage is not under the control of the hydrographic offices of these countries, and in some it is under the control of various port authorities, and not grouped under a single government department. In matters of this kind, the International Hydrographic Bureau can only render service to the cause by the publication of its synoptic studies, inviting attention to the existing lack of uniformity, to be used as a basis for further study and agreement by those directly concerned with these questions.

The International Hydrographic Bureau also submitted to the international conference on the safety of life at sea, held at London, 1929, for its consideration, memoranda of its views as to the changes that should be made in the "International Regulations for Preventing Collisions at Sea."

Another very useful field of endeavor of the International Hydrographic Bureau is the dissemination of general and detailed information on matters pertaining to hydrography and navigation. For this purpose the bureau publishes in the monthly *International Hydrographic Bulletin* information of immediate interest and importance. This *Bulletin* contains also, a list of all recent hydrographic documents and publications received from the various hydrographic offices of the world, and invites attention to matters of urgent importance. The semi-annual *Hydrographic Review*, published in both French and English, contains monographs of general interest to hydrographers and navigators, important articles translated

from foreign publications and descriptions of new methods and instruments in use in the various countries. In this manner each hydrographic office is enabled to keep in touch with the methods used and work being done by the other hydrographic offices, which will gradually lead to an improvement in the methods of use, besides helping to bring about uniformity in the hydrographic office documents and publications.

In general it has been found in the international hydrographic conferences held since the inception of this bureau, that all countries were anxious to bring about this uniformity in hydrographic office documents and publications, which is so greatly to be desired. Possibly the greatest hindrance to the realization of this ideal is the ever present question of costs, and while it may be relatively easy to obtain agreement regarding some matters, in others the cost of making the change is almost prohibitive. In spite of these drawbacks, however, the International Hydrographic Bureau has to its credit a long list of accomplishments in this line of endeavor which will certainly do much to make navigation safer and easier. Amongst these may be noted: The universal adoption of the compass graduation from 0° to 360°, the standardization of numerous signs and symbols in use on marine charts, the establishment of central offices in various ports for the exhibition of *Notices to Mariners*, as well as the publication of numerous special publications on technical subjects, which include: four on echo sounding, two on visibility of lights, three on uniformity of buoyage and buoy lighting, two on data on uniformity of storm warning signals, and one on each of the following:

International low water.
Data on wind force and the Beaufort scale.
Investigation of harmonic constants; prediction of tides and currents, and their description by means of these constants.
Table of harmonic constants.
Tide prediction machines.
Data on coastal signals, with proposals for their unification.
Data on port signals.
Data on safety of life at sea.
List of life-saving stations.
Ocean currents in relation to oceanography, marine biology, meteorology, and hydrography.
General list, arranged by oceans, and historical cards of shoals of doubtful existence and of shoals the positions of which are doubtful or approximate.
Table of meridional parts.
Manual of symbols and abbreviations.
Limits of oceans and seas.
Geographical positions.
Catalogue of original charts.
Planisphere.

In general it may be stated that the International Hydrographic Bureau is not only a liaison between the various hydrographic offices of the different states, but is a sort of "clearing house" for all hydrographic information.

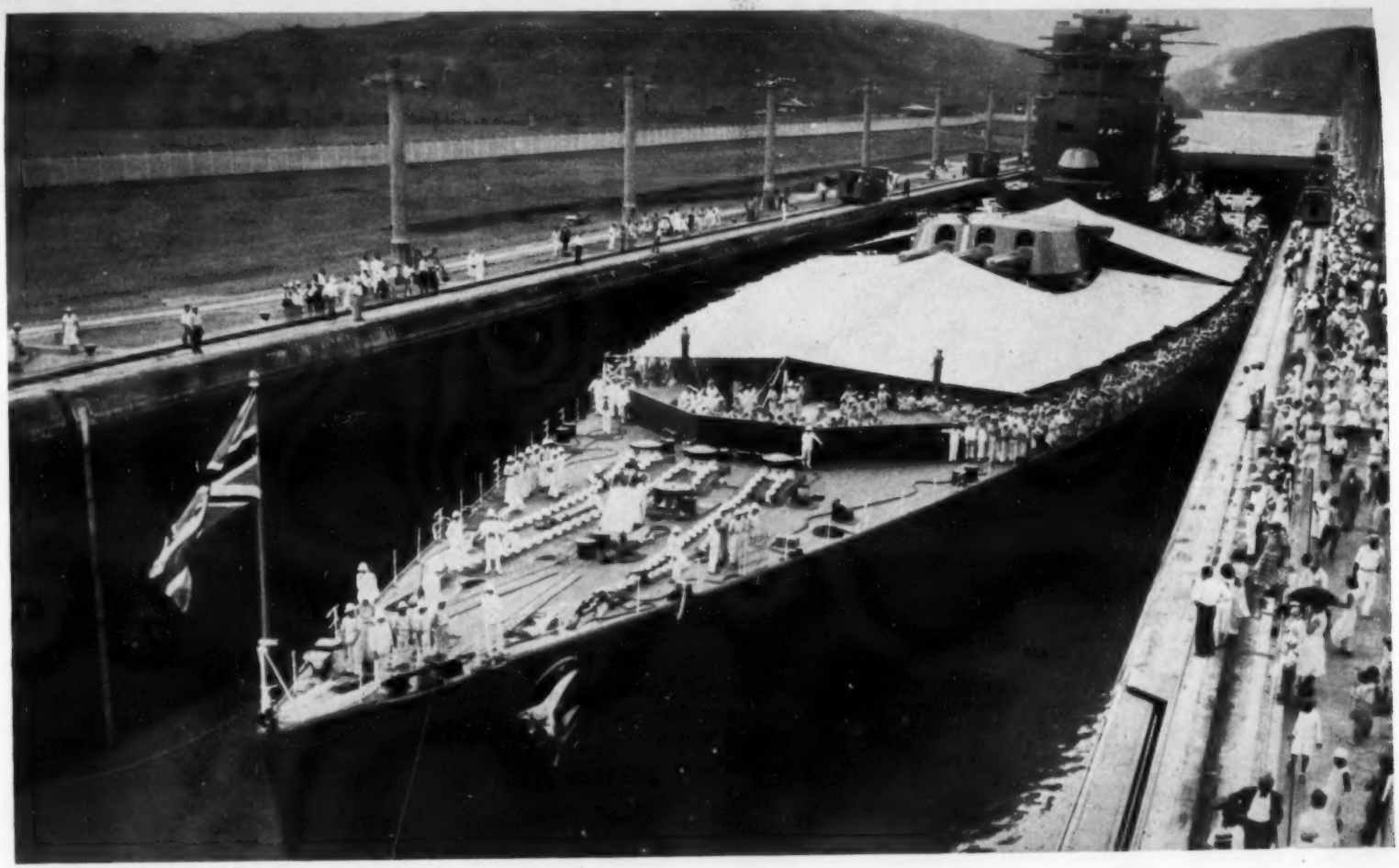
Courtesy Rear Admiral A. T. Long, U. S. Navy (Retired)

INTERNATIONAL HYDROGRAPHIC BUREAU, MONACO

Courtesy Rear Admiral A. T. Long, U. S. Navy (Retired)

A VIEW OF THE BUREAU FROM ANOTHER ANGLE

A VIEW OF THE BUREAU FROM ANOTHER ANGLE



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THE WORLD'S LARGEST BATTLESHIP, THE H.M.S. *NELSON*, SQUEEZES THROUGH THE PANAMA CANAL

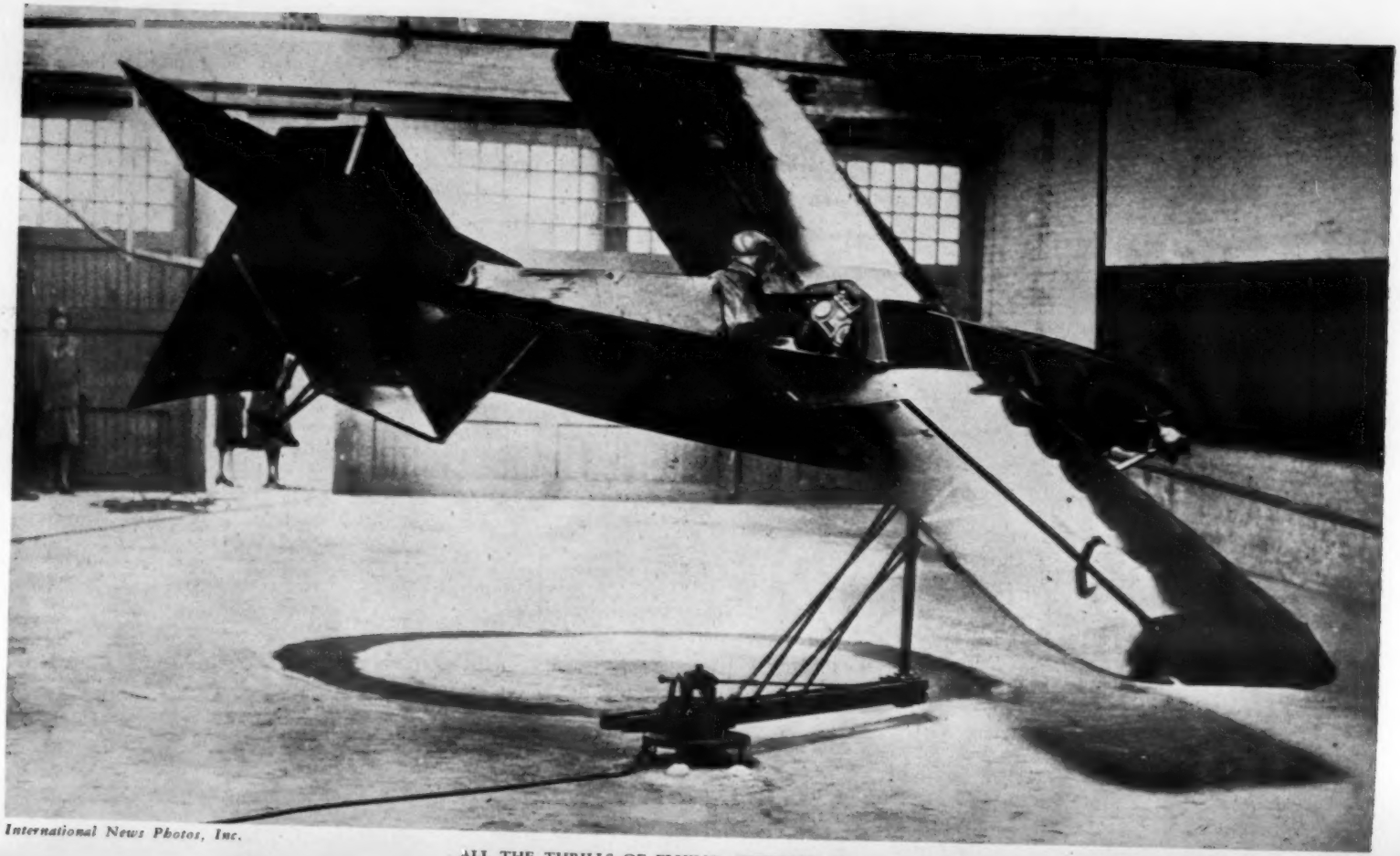
International News Photos, Inc.

NAVY PLANES ON MOTHER-SHIP, U.S.S. *LEXINGTON*, DURING THE RECENT NAVAL MANEUVERS AT PANAMA

Acme

AERIAL FAREWELL TO PRESIDENT HOOVER

Squadron of planes and Army blimp fly over the U.S.S. *Arizona* at Hampton Roads, Virginia.



International News Photos, Inc.

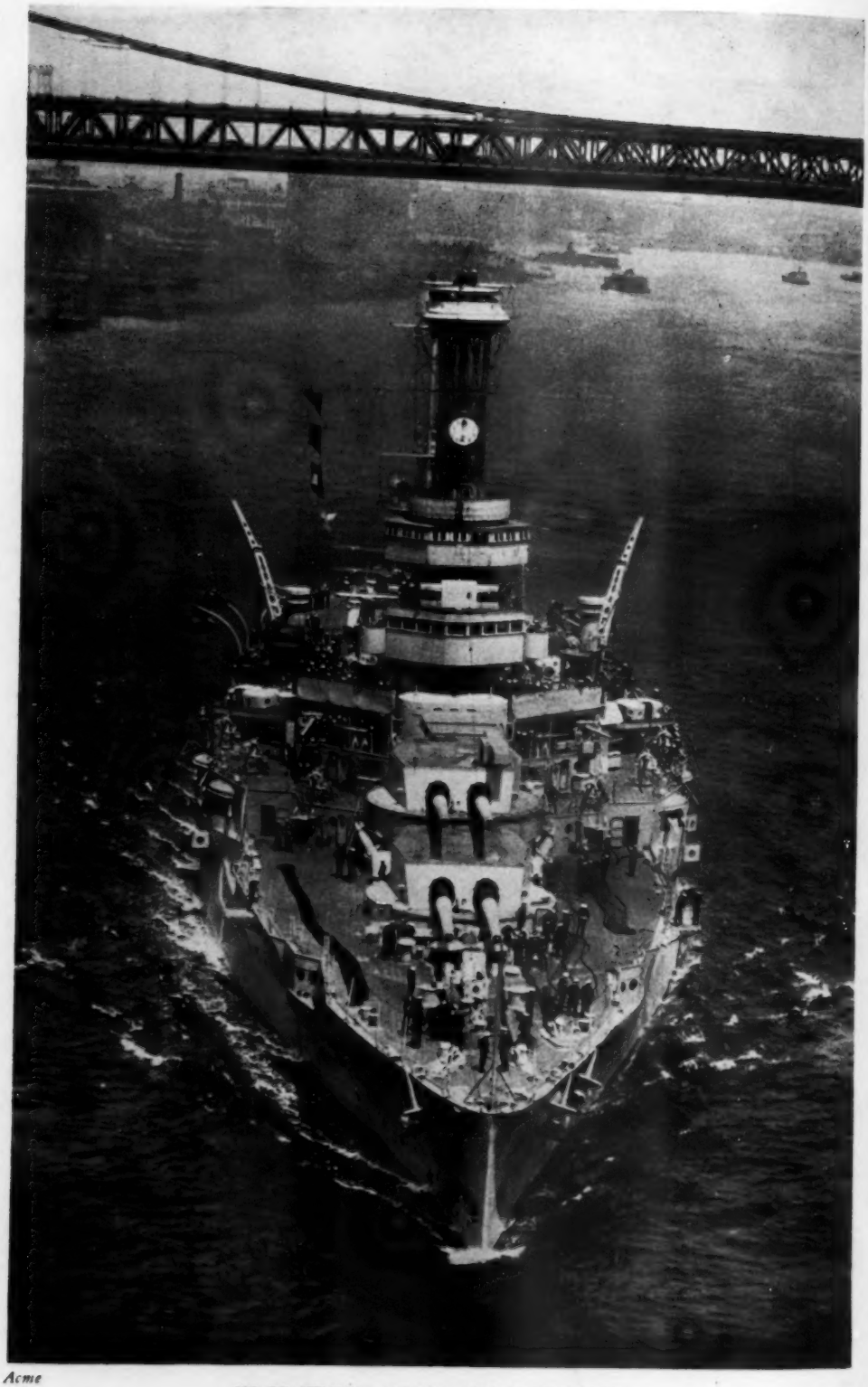
ALL THE THRILLS OF FLYING—WITHOUT THE RISK

International News Photos, Inc.

ALL THE THRILLS OF FLYING—WITHOUT THE RISK

Acme

PRESIDENT HOOVER AS HE CAME ABOARD THE U.S.S. *ARIZONA,* ABOUT TO LEAVE FOR HIS TOUR TO PORTO RICO AND THE VIRGIN ISLANDS



Acme

TO BE STRIPPED OF HER WAR IMPLEMENTS

The Navy Department, in compliance with the terms of the London Naval Treaty, took the first step by issuing orders for disarming the *Wyoming*.

WORLD ECONOMICS AND DISARMAMENT

By Lieutenant Commander Stewart F. Bryant, U. S. Navy (Retired)

Disarmament alone is futile

At THE time of the French Revolution each country was nearly self-sufficient, was distinct in culture, customs, and ways of thought; each country produced its own food supply and supported its own population. Following that time industry and the machine age slowly took toll of individual liberty as the economic life of the world became molded into parts of a huge international machine. Industrial revolutions took place. A struggle for industrial supremacy contributed largely to the causes of a world war of unparalleled loss and consequence.

An unavoidable depression, postponed for more than a decade after the war, has now brought about an intensified world situation. Looking to the future we can see many signs of increasing competition under new balances of economic power with particular strain upon the less fortunate. In this situation there are no international agencies with actual authority as yet, that can cope with the tasks of economic pacification.

Attempts at disarmament and arbitration will be greatly weakened if economic causes of conflict cannot be controlled. There is always a point of strain at which diplomacy will break down.

Disarmament alone is futile. It must progress along with the solution of problems of international friction, chief among which, as we shall endeavor to show, are the economic issues.

The position of the United States in these affairs, with possession of the greatest economic power ever known, presents one of the most far-reaching problems which has ever confronted international relationships.

The part that we must play and the effect of these problems on our national defense are factors of interest and concern to officers of the military services.

Discussion herein will deal with the underlying economic problems of the present international situation, with the more specific causes of economic friction and with the dependence of armament reduction upon world wide economic issues.

The Results of Twelve Years' Post-War Experience

The total direct and indirect costs of the war have been estimated by the Carnegie Endowment as $337,946,179,657.

There has been no relief from population pressure as the survivors are relatively less able to provide the necessities of life than they were before. After losing a million men in the World War, England now has about two million unemployed.

There has been no relief from the penalties of economic competition as the general dislocation of industry has made the struggle more intense. This dislocation surpasses in importance the harm from actual destruction of property. The full meaning of the consequences of the war cannot even yet be clearly estimated.

It has injured the economic fabric of the entire world and created new economic forces and impulses that constitute the most serious and most permanent of all dangers which are likely to threaten the cause of peace.

No machinery for the settlement of international disputes can be relied upon to maintain peace if the economic policies of the world so develop as to create, not only deep divergencies of economic interest between different masses of the world's population, but a sense of intolerable injury and injustice.

In the stress of world depression governments have continued to take action considered unjust and injurious, at a time when there is no restraint of law or custom among nations to prevent. Under such action it is inevitable that embitterment increases. To aggravate matters, the industrial nations have reached a condition where machine production has seriously outstripped world consumptive capacity.

And in this situation "The theory of world economy is in a stage of development so primitive that languages other than German have not a generally recognized word for it."

The Fundamental Difficulties

No way has yet been found to remedy the inequalities in national economic opportunity.

There is no method yet available for the common integration of the raw materials of the world to meet the necessities of all peoples.

There is no practical recognition of the fact that economic life has become international and that its repression under national ambitions and self-interest is accumulating impulses that will ultimately work common injury.

Public opinion and general enlightenment have not yet reached the point where any single government or group of governments would be supported in the remedy of these problems. The world is organized on an acquisitive basis and rivalry is a dominant factor.

Economic Interdependence

In the struggle to overcome the niggardliness of nature many nations are potentially at war with each other in a condition of economic anarchy. Paradoxically nations are now interdependent and cannot carry on without the help of the others. "The very fabric of modern life is built upon the interchange of goods of widely sundered nations."

The United Kingdom imports about one-fifth of the world's exports, and exports nearly a third of its industrial output.

In the United States a fifth of our industrial workers are dependent for their own purchasing power upon the sustained purchasing power of foreign consumers.

Japan is precariously dependent upon her exports and imports. Almost half of her exports is in silk. Nine-tenths of this silk goes to the United States. In return Japan imports over half of her cotton goods from the United States.

Interdependence has accelerated in recent decades. "The per capita consumption of minerals has multiplied ten times in only forty years."

This acceleration, as is commonly realized, has been due to the rapid improvements in communication and transportation. The pace, however, has been too swift. Material progress has set a pace too rapid for political capacity.

The increasing economic interdependence of all countries has presented an entirely new set of facts and forces. Many of them are either unknown or else are little understood. This has been particularly serious since so many of them are economic while those entrusted with the conduct of public affairs and with the responsibility of making decisions have lacked economic training. Economists without political training might have done still worse. There certainly has been a crying need for the blend of the two.

The Shift of Economic Power

The relative but not absolute decline in British economic supremacy began about 1870 when Germany and the United States first equaled her pace. Later came the supremacy of oil over coal, a particular setback to the British position in that it placed a vital dependence far outside her homeland and in striking contrast to her native coal resources. The change marked a turning point towards American economic supremacy which has been vividly exposed by the results of the World War.

England in the meanwhile has built up a huge industrial machine of a type that must either operate to capacity or result in intense strain.

At present we find her dominions taking up home manufacture and we find strong competition from outside. French and German coal and steel have in addition caused considerable inroads into these two essential industries of the United Kingdom. France is aligning herself with industrialized nations at an unfortunate time. All in all England faces a world which has improved upon her industrialization, a world which can produce more cheaply. Her former economic rank may never be regained.

Here, we shall examine the shift of world trade, approximately indicated in the following table. The figures show percentages of total trade of the world.

	Northern North America	*South America*	*Asia*	*Europe*
1921-25 (average) .	14.3	6.8	11.3	527
1929	18.3	10.3	12.3	44.7

The drift to the American continents is shown.

Changes in economic supremacy do not result in this age without an amount of distress that must compensate in part for the gains of the more fortunate. It is a pitiless application of action and reaction. In the intensity of economic competition the stronger and richer powers have the tools to compete with additional advantage. It does not add to economic peace when a stage is reached where competition for luxuries is at the expense of others' necessities.

Contrasts of Economic Power

The table below shows the relative standing in first and second place of the principal naval powers in production of world commodities. Percentages of total world production are noted as far as available.

United States

	Per cent
1 Aluminum	35
1 Arsenic	
1 Artificial silk	25
1 Borax	66
1 Coal	44
1 Copper ore	
1 Cotton	50
1 Cotton seed	53
1 Gypsum	
1 Iron ore	
1 Lead ore	
1 Magnesite	
1 Maize	75
1 Molybdenum	
1 Natural gas	
1 Oats	32
1 Petroleum	70
1 Phosphate	40
1 Sulphur	81
1 Tobacco	38
1 Wheat	17
1 Wood pulp	33
1 Zinc ore	
2 Barley	
2 Bismuth	
2 Gold	12
2 Hops	24
2 Silver	25
2 Wool	10

British Empire

	Per cent
United Kingdom	
1 Hops	33
2 Coal	21
Australia	
1 Cadmium	
1 Wool	26
Canada	
1 Asbestos	
1 Meslin	
1 Nickel	90
2 Wood pulp	
Ceylon	
1 Graphite	15
India	
1 Jute	90
1 Manganese ore	40
1 Mica	
1 Sesamum seed	
2 Chrome ore	
2 Cotton seed	
2 Tobacco	
Malaysia	
1 Rubber	40
1 Tin	50
Rhodesia	
1 Chrome	
2 Asbestos	

France

1 Beauxite	
2 Iron ore	
2 Potash	

Italy

1 Quicksilver	50
2 Artificial silk	
2 Asphalt rock	
2 Olive oil	
2 Sulphur	

Japan

1 Camphor	
1 Silk	65
2 Rice	11

Relative incomes per capita of these powers have been estimated for 1914 as follows. Approximate national wealth is shown for years indicated.

	Income Per Capita	Total Wealth
United States	$335.00	$408,700,000,000 (1929)
United Kingdom	243.00	119,200,000,000 (1925)
France	185.00	60,000,000,000 (1925)
Italy	112.00	25,000,000,000 (1925)
Japan	29.00	51,017,000,000 (1928)

The estimates are taken from miscellaneous references and must be accepted as approximate only. Total world wealth has been given as $1,100,000,000,000 of which the United States would hold as much as 35 per cent and more than the combined wealth of all other principal naval powers.

Without desiring to present too many statistics, emphasis should nevertheless be put upon the question of food supply. It is not generally realized how much the net value of material world production rests upon food. Out of a total of 90 billions of annual world raw material production in dol-

lars there is, roughly speaking, some 59 billions in food, 10½ in non-metallic raw materials, 10 in fuels and sources of power, and 3½ in metals. Herein we find a prime dependence upon the plant and animal industry of nations despite the strategic importance of minerals.

In this consideration of food supply, the United States occupies the unique position of being the first great nation in history to combine comparative insularity with self-subsistence in food, two factors which stand for unparalleled strategic power.

Consideration of all these factors leads to the belief abroad that the United States has been prematurely thrust into an inheritance of economic domination. A study of the tables aforementioned may explain why outsiders to our wealth look ahead with fear and apprehension as to what we are going to do with it. For with such power, as a rule, comes not apathy but increased aggressiveness. The whole situation throws a precarious indeterminate in world politics.

Here is a comprehensive British point of view:

> In America we have the example of a society which is not checked by tradition, but which is able to devote its whole powers to the economic exploitation of the natural resources of a continent.
>
> If France, Germany, and England can forget their quarrels and embark on a policy of political and economic coöperation they can develop an economic civilization not inferior to the United States. If, on the other hand the tradition of nationalist rivalry and competition is continued, the existing state of tension can only increase and may lead to a complete economic breakdown.
>
> The people of western Europe are now faced with the competition of the United States. They have a far larger population than is warranted by the extent of their territory and their reserves of natural resources. They are forced to rely for their continued prosperity on the control of extra-European markets and colonial sources of raw materials, and this leads to an intense rivalry which involves international war or at least a competition in armaments. So long as this condition continues, juridical methods for the attainment of world peace cannot lead to security.
>
> The obvious remedy is to scrap the nationalist tradition, sweep away the frontiers and organize Europe as a gigantic economic unity—the United States of Europe. This organism would surpass the United States in population, in military power, and possibly even in wealth, for the new federation would be able to control Africa and a large part of Asia and Australasia, and would possess an unlimited field on which to draw for raw materials—but it is impossible. Canada and Australia would prefer to throw their lot with the United States rather than be controlled by an omnipotent European federation and you would have the anomolous situation of a world federation of English-speaking peoples from which only Britain was excluded. And Britain could not join it without depriving the European federation of the command of the sea and of the greater part of its colonial resources.

These arguments emphasize lack of equilibrium in the balance of economic power.

The Risks of Industrialization

As the process of industrialization increases in intensity so in proportion does the demand for foreign markets. When these markets are lost to other powers, or when colonials build up their own manufactures the huge national plant faces an overproduction ending in distress.

The strength of England has been based upon an industrialization unsurpassed in intensiveness and upon a foreign trade unequaled in magnitude. The penalties of her present situation will probably be in serious proportion. Her unemployment situation will require many long years to correct.

Industrialization is a precarious venture in national life. And with it there are no forces that lead a nation to deliberately lessen its economic position.

When one considers for a moment the total needs and desires of the mass of individuals of a nation in economic distress it is not difficult to sense the deep feeling that may accumulate.

Japan may some day face the same situation that England is now enduring, particularly when her prosperity is even partly based on such a commodity as silk, that fluctuates in value and is replaceable by artificial substitutes.

Mass Production

World population 1913 to 1925 increased	5.3 per cent
World trade grew	4.5 per cent
The production of food stuffs and raw materials increased	16-18 per cent

The plant capacity of the world still exceeds in many lines the consumptive capacity with resulting economic strain.

Mass production carries increased force and impetus, more overhead, higher rates of production, and has intensified the struggle for business.

Tremendous sacrifices are needed in retrenchment but no nation desires to lead in the sacrifice.

Population Pressure

Here we shall try an experiment in measuring the future intensities of population pressure from a multiple of population increase and present density per unit of arable land. The results are inaccurate but indicate nevertheless a few of the sore spots in the future of population problems.

	1927—Excess of births over deaths per 1,000	*1925—Population density per square kilometer of arable land.*	*Approximate factor of increasing population pressure*
Japan	15.2	993	15,094
Italy	11.2	307	3,438
United States..	8.4	85	714
England and Wales	4.3	800 (U.K.)	3,440
France	1.6	178	231

These inequalities add one more burden to the economics of world peace. Possible remedies lie in improved cultivation, change of diet, industrialization, emigration, and birth control.

The first two offer no practical solution.

Industrialization for Japan and Italy has serious handicaps in the necessity for importing a large share of materials for manufacturing, a crippling process in any competition with nations that possess raw materials under their own flag.

Emigration in the long run only provides holes in a population that are filled up with an accelerated rate of increase.

Birth control is seized upon here and there as a panacea for almost any problem. It is not so simple. There are strong religious prejudices against it, for example in Italy where it may be needed most. No nation desires to sponsor such a movement officially, partly from the old beliefs in security in numbers and partly that population decrease ultimately brings a decrease in prosperity. Also, it has yet to be proven that artificial interference with such vital functions of the human system on a wholesale scale will not end in the serious physical deterioration of a people.

The problem of overpopulation will remain as a principal impulse in economic struggle.

Colonial Impulses

The day of relative white supremacy is at its zenith. There can be little if any increase in the colonization of backward peoples. The era of conquest is over. The general drift is towards the revolt of subject races who increasingly aspire to social and industrial independence. India and the Philippines serve as examples. In such areas of political instability capital is insecure in investment, development stagnates, and economic reaction is inevitable. In the loss of India, Britain would lose about a third of her income. Nations overdependent upon colonies have disturbing elements to face in economic security.

Aspects of Intervention

Intervention may be a violation of sovereignty, it may be called a cloak for oppression, and it may be very repugnant to the modern sense of justice. But in the struggle of man as a whole to sustain the standards of economic life the natural resources of the entire world must be kept available. Freedom of exploitation of all areas must be kept open. There is also a moral obligation of the inhabitants of every country to become a part of the international community, to fit themselves for membership in it and to make such contributions as they can to its welfare. Backward peoples unable to develop their own resources cannot, under the economic pressure of human needs as a whole, hold back the utilization of areas needed by the world. Economic frontiers diminish and disappear as the process of economic integration increases with growing world population. The results bring inevitable friction.

Tariffs

On one hand tariffs stimulate domestic production, allow infant industries to be reared, enhance self-sufficiency, and diversify industry with a certain amount of social and educational advantage.

From another point of view this system of aid is but an elaborate method of increasing the income of one group in a country at the expense of another; of increasing temporarily the income of one country at others' expense; and of adding to the collective overhead and expense of the world as a whole.

Such protectionism too easily leads to di-

rect conflict with the efforts of other countries headed for opposite goals; it leads to reprisals; and from economic conflict to enmity and political conflict.

From a consideration of practical world economy "each nation should devote itself to the production of goods for which it found itself most favored by natural conditions. In this way each would operate at lowest production costs. Thus each would reap a twofold advantage, being in a position at once to sell as dearly and to buy as cheaply as possible."

Further than that a nation must stimulate imports if it wants the best customers available to pay for its exports.

Instead we have a world-wide system of competition in which every nation struggles to become self-sufficient and in which each one seeks a favorable export balance. It is algebraically impossible and could, as one writer puts it, be carried to a stage of collective economic insanity.

At the council of the League of Nations, June 16, 1927, this statement was issued: "The conference declares that the time has come to put an end to the increase in tariffs and to move in the opposite direction."

There are two sides to the recent American tariff increase. On one side, foreigners look with bitterness upon an increase made by the one country in the world most blessed with wealth and most able to help the cause with the least relative sacrifice.

On the other hand these same critics do not remember that the United States still imports more free goods than any country except Great Britain and that some two-thirds of American imported goods are admitted free.

Here let us stress an important element of American strength, a homogeneous market in the forty-eight states free from tariff restrictions. It is an outstanding advantage held over Europe.

There are two considerations which cripple progress in tariff reductions. First, the few individuals who favor reduction are manufacturers who depend upon foreign orders, some economists and bankers, persons living upon fixed incomes and civil servants. They are hopelessly outnumbered.

Second, as one writer puts it, the unequal distribution of natural opportunities must be compensated by a code of international consideration.

Such a code is at present unknown. Progress in world business is based upon the mainspring of competition in which good will and charity have small part. A corporation spends a million on good will. The system of world economy is somewhat primitive in spending practically nothing on it. The facts must be faced in national defense. There is as yet inadequate influence to regulate the condition for common good.

Reparations

Without going into the general financial instability caused by the uncertainties in payment of post-war obligations, there is another aspect of this subject to touch upon. If reductions are not made, and if German defaults are avoided, there will come a huge flow of German goods to cause acute additional trouble for her competitors. Overproduction will be increased and result in further strain in a European situation already approaching danger points.

Corporate Interests

With the exception of firms that profit from war, the corporate interests with international holdings are naturally concerned with better profits that arise from the stability of peaceful relations.

In certain respects these interests are an asset to world peace.

Large international industrial combines have extended their operations into a political no-man's land, though separately liable to the laws of each country concerned. They menace industrial democracy but are striking examples of the existence of an economic world unity.

These big interests, however, operate on tremendous scales to reduce unit costs. In times of depression they become very sensitive, and unavoidably resort to vigorous sales methods, often attended with ruthless policies destructive to weaker competitors. They have no altruism, and where their own interests are adversely concerned, small capacity for international consideration.

Many economic bodies have become cosmopolitan, owe allegiance to no single state, and are outside effective supervision.

Others coming within the jurisdiction of a single state exert a powerful influence beyond its frontiers creating far-reaching reactions throughout the world.

International combinations, monopoly of certain important products, the private trade in armaments, the evils arising from certain types of con-

cession, the investment of capital to exploit cheap and unorganized labor—these have created friction and hostility and are disturbing factors.

Economic Complications of National Defense

A primary responsibility of government lies in national defense, one element of which is the insurance of maximum self-sufficiency during war. This includes self-subsistence and materials for prosecuting war.

In meeting these requirements nations must resort to accumulation of vital supplies not found in the homeland, to concessions and colonies for insuring sources under their own flag, to alliances, to development and subsidy of merchant marines, to the development of naval bases to protect trade routes, and to the construction of suitable war vessels to insure passage of supplies to the homeland during war time.

In England's case these trade routes are jugular veins which, if severed, would destroy the life of the empire. Her merchant marine and her Navy stand for security from starvation in the homeland.

Even the United States has some thirty vital materials that must be imported in great quantities to sustain her industrial life in peace and which would be crucially needed in war time.

Paramount national instincts for self-preservation cannot in these matters yet be trusted to international good will and to international organizations for adjusting disputes.

As a result we have the perpetual struggle for such things as petroleum sources, for coal, iron, and other war essentials, for merchant marine tonnage in excess of the world's needs, and for additional naval forces.

The economic competition between rival nations is further intensified as a result.

There is also a technical factor of a new nature that is injected into efforts to reduce armaments, that of the destruction of shipping by aircraft in war time. The issue of any transoceanic future conflict may in great measure rest upon the annihilation of enemy trade by sea. Aircraft in such an unfortunate event would play a principal part. And yet, due to the urge in development of commercial aviation, there has as yet been found no means of limiting military and naval air forces. This is an outstanding stumbling block in the reduction of armaments.

Conclusions

It is not intended, herein, to show how gloomy the world economic situation can be painted. The world market should be and is in many respects, a field of great service within which commerce and industry engage in the ministration of increasing the world's welfare. Also, it is not intended to overlook the efforts and the progress of the international agencies struggling to meet the economic problems that beset the world today. The remarks herein have opposite purpose in showing the vital importance of these agencies, upon whose success not only depend the return of world prosperity, but in good measure a more advanced stage of security from war.

Our object is only to enumerate the principal frictional economic impulses. A summation of these impulses leads to the contention that in the cause of peace they transcend any other group of impulses, be they political, social, religious, or cultural.

Every right-thinking person desires to see coöperative reduction of armaments. No longer can gain from war equal the loss.

Reasonably balanced armaments are not a cause of war. They but symbolize the deep-seated errors in human relationships that require correction.

It is one of the first principles of business to face the facts. It is of unquestionable advantage to learn to think in terms of peace. But more than that, the influences leading towards war must be exposed and attacked if they are to be suppressed in time.

As world industrialization constantly increases so will the problems of world economics. They, above all others, must be solved or at least ameliorated before nations can put their security in further international trust.

EXTERIOR BALLISTICS—WIND CORRECTION

By Lieutenant T. J. Raftery, U. S. Navy

IN PRESENT long-range firings, where the maximum ordinate is so great, the variations in the wind in the different altitudes present a rather difficult problem in compensating for its effect on the trajectory of a projectile. No attempt will be made here to solve the problem, but merely to point out some of the factors that show the error introduced by assuming the wind velocity to be the same at the different altitudes through which the projectile travels as at the surface. A solution to the problem would require work and research, which, at the present, opportunity does not permit.

Ekman, a Scandanavian, in studying ocean currents at different depths, established a relation between the surface current and the current at various depths. He found the relation between these currents could be expressed conveniently by a logarithmic spiral which has since been called the *Ekman Spiral*. Later this same type of spiral was shown to apply to winds in the atmosphere. Briefly summarized, it shows that, in the northern hemisphere, the wind direction gradually changes to the right with increased altitude above the surface until a certain level is reached, where it assumes a steady direction. Also it increases in velocity with altitude reaching a maximum at a certain level, then decreasing to a point where it assumes a constant velocity. This level where it reaches constant velocity is the same as the level where it attains steady direction. Over the ocean the difference between the direction at the surface and the direction at the level where it becomes constant is on the average about 20 degrees.

To show the amount of variation between the surface velocity and the velocity at different altitudes, a table of approximate average wind velocities, over water, is here quoted from Humphreys' *Physics of the Air*, 1929.

Altitude (meters)	*Wind velocity surface*
surface	1.000
75	1.305
150	1.512
225	1.642
300	1.717
375	1.751
450	1.759
525	1.752
above 525	1.673

Over land areas these variations are much greater.

No effort will be made to prove the accuracy of these values, but they can be accepted as fair averages of the ratios between wind velocities at the various levels and at the surface, and they also show how these variations take place.

To get accurate values, actual pilot balloon soundings in the area to be considered and at the time for which the information is desired must be made. There are too many local factors that enter into the problem to permit a solution at one time and place satisfying that at another. Among these factors are: latitude—the variation is different in different latitudes; topography—over land the variation is different from that over water; different air masses may be displacing one another at varying levels, thus causing irregular air currents; or the density of the air may and does vary at different times and places.

These all tend to make the problem complicated, but it is believed that if sufficient pilot balloon observations were made in a given area, a very good idea of average conditions could be obtained or what is better, possibly empirical factors could be derived, which could be applied to later observations, so that they might make their compensation rapid and accurate.

Since in long-range firing, and, also in bombing, during the greater part of the time of flight of a projectile it is in the upper levels, the error introduced by using surface wind velocity and direction in the computation of the ballistic correction is readily seen from the table to be fairly large. Take as an average "mean wind velocity" 1.5 times the surface velocity, and the "mean wind

direction" as 10 degrees to the right of the surface wind. It is believed that these values are fairly conservative. Let the surface wind be from 100 degrees to the left of the line of fire, and the velocity be 10 knots. This would make a "mean direction" of 90 degrees to the left of the line of fire, and a "mean velocity" of 15 knots.

Assume a range that had a time of flight of 40 seconds. If the surface velocity and direction were used, it would be expected that during flight the projectile would be moved to the right $\frac{2027 \times 10 \times 40}{60 \times 60} \sin 100$ degrees or 221.8 yards.

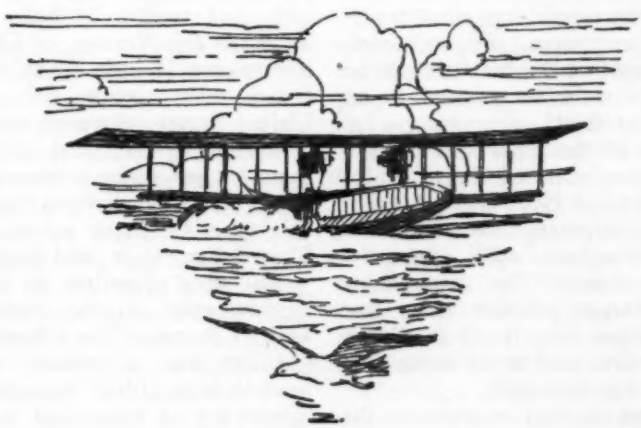
If the "mean velocity and direction" were used, the amount would be $\frac{2027 \times 15 \times 40}{60 \times 60}$ sin 90 degrees or 377 yards.

The difference is 115.2 yards.

It is felt certain that the latter computation is more nearly correct than the former. Therefore if surface wind velocity and direction are used in computing the ballistic correction for effect due to wind, a large error still remains for which no compensation is being made.

Of course if the wind were at any other angle to the line of fire the error in deflection would be less, but then an error in range would be introduced. In passing it might be well to note that the error as computed above is over twice the width of the usual target screen.

Unfortunately, specific examples to more clearly demonstrate these conditions and their effects are not available at present, but it is believed that enough has been said and pointed out to show the importance of the problem and the need for a thorough study of it. These variations in wind velocity and direction with altitude are sufficiently large to merit proper consideration and especially with the long ranges now being used, the study of them is all the more important and well worth while.



THREE VETERANS OF THE UNITED STATES NAVY

By Lieutenant L. S. Perry, U. S. Navy

UNDER the terms of the recent London Naval Treaty, three of the first superdreadnoughts of the United States Navy have been retired from active service. These battleships, the *Florida*, *Utah*, and *Wyoming*, were first seen together in the Atlantic Fleet in 1912, and the service of each extended over a period of more than eighteen years in the first battle line.

The terms of the London treaty require that the *Florida* be rendered unfit for warlike service within twelve months from the coming into force of the treaty, and be scrapped within tweny-four months. The provisions of both the Washington and London treaties allow one vessel only to be devoted to target use exclusively, by each of the signatory naval powers, and for this use the *Utah* has been designated. The *Wyoming*, under the same provisions, will be retained in service under certain restrictions, and with a reduced complement will act as flagship of the newly organized training squadron. The training ship retained, under the restrictions of the treaty, must be so altered as to be unfit for service as an effective unit of the fleet.

The last service of the *Utah* and *Florida* ended with the completion of the midshipmen's training cruise of 1930, and after disembarking the midshipmen, they proceeded to a point off the Virginia Capes, where the *Wyoming* joined them. The three ships fired a farewell target practice, their last salvos sounding their own death knells as units of the battle line, and at the same time saluting each other in farewell.

These ships started their services in the United States Navy just after the present dreadnought-type battleship had been accepted as the standard by the various naval powers, although each ship showed great improvements over the original dreadnoughts laid down by the different naval designers. Prior to 1906, practically all large battleships in the world's navies, had in their main armaments at least two different sizes of guns. In the above year, however, there appeared a ship that was destined to be the model, in principle at least, for practically all future battleships.

The British battleship *Dreadnought* joined the Grand Fleet in 1906, and her appearance caused no little speculation among the naval designers of the various countries. She was the first modern all-big-gun ship, and so her name naturally became a type name for all succeeding ships of similar gun disposition, in all navies.

Superdreadnoughts, so called, were soon displacing the earlier dreadnoughts, and naval experts were striving to produce ships of all large guns, with a maximum available broadside and with high speed qualities.

Following the appearance of the H.M.S. *Dreadnought*, France laid down the *Danton*, of 18,400 tons displacement; Japan completed the *Aki*, with a battery of four 12-inch and twelve 10-inch guns; Germany launched the *Nassau*, of 18,500 tons carrying twelve 11-inch 50-caliber guns, twelve 6-inch, and sixteen 6.4-inch guns. The United States answered with the *Delaware*, completed in 1910, and carrying ten 12-inch guns as her main armament. By the end of 1911, Great Britain had ten vessels of this type, Germany seven, France six, the United States six, and Japan four.

The first country to mount the main battery guns on the center line was the United States. The advantage of this disposition was of course to obtain a full broadside on either beam, but it had the disadvantage of somewhat limiting the fore-and-aft fire. Other navies followed the United States in this gun placing, although many retained two or more waist turrets, to increase the ability to fire at sharp angles on the bow or stern.

The advent of the word "dreadnought" as a type name for battleships of this period brought forth a rather peculiar discussion

as to which country first produced such a ship. Naturally this honor was credited to England, due to her designing of this new type in the H.M.S. *Dreadnought.* Disputing this claim, however, we find the late Mr. William Boerum Wetmore, of Allenhurst, New Jersey, claiming this honor for the United States, in a letter addressed to the *Scientific American* in November, 1911. Mr. Wetmore claimed that the United States was the first to build such a ship, that conformed to the accepted definition of the word "dreadnought," which was in brief—"a ship of all large guns for its main armament." The altering of the frigate *Roanoke,* in 1863, into a dreadnought carrying six large guns, was the basis of his claim.

Mr. Percival A. Hislam answered this claim for Great Britain, stating that his country had, during the years 1862-63, in a similar manner altered the old frigate *Royal Sovereign* into a dreadnought carrying five guns. This apparently had settled the matter, as this ship antedated the *Roanoke,* and perhaps this claim would have been final but for further research by Mr. Wetmore.

However, in a letter to Lord Brassey, one of the leading naval authorities, Mr. Wetmore asked for all of the particulars concerning the conversion of the *Royal Sovereign.* In his reply, Lord Brassey stated that the exact date of her conversion was hard to determine, as it required a long time, but that it had occurred between 1862-64. The *Royal Sovereign,* after conversion, conducted speed trials during which she attained a speed of 11 knots. Later she conducted a series of experimental firings and was also used as a tender for H.M.S. *Excellent,* although she was never used as a fully commissioned seagoing vessel. No sails were carried on the three pole masts of the *Royal Sovereign* after her conversion. She was armored all over, her sides being of solid timbers three feet in thickness, strengthened internally by diagonal iron bands, and clothed externally with 5.5-inch rolled armor plates.

Mr. Wetmore then produced the *Onondaga* as final proof that the first dreadnought rightfully belonged to the United States. Congress, in 1861, authorized the building of the *Onondaga* which was one year prior to the starting of the *Royal Sovereign's* conversion. The ship was built at the yard of T. F. Rowland of the Continental Iron Works at Greenpoint, Long Island, and Mr. George W. Quintard, proprietor of the Morgan Iron Works, was the contractor for her hull and machinery. The *Onondaga* saw active service during the Civil War on the James River. She was of high freeboard, 228 feet long, 50 feet beam, 1,250 tons, armored her entire length, had four propeller engines, and carried four large guns mounted in turrets. Mr. Quintard through an act of Congress dated March 2, 1867, purchased the *Onondaga* from the government for $759,673 which was the cost of building the vessel. He later resold the ship to the French government, where she served for four years, under a new name, in the French Navy.

The superdreadnought succeeded the modern dreadnought. All-big-gun batteries were followed by an increased number of guns and the *Wyoming* was the first to carry twelve 12-inch 50-caliber guns.

"Offensive power," so much sought after since the first warship was designed, was greatly augmented by the appearance of the larger caliber, armor-piercing projectile which was first used in the United States Navy by the U.S.S. *Oregon* in 1908. To defend the ships against this super-projectile, however, required all navies to clothe their ships with modern casehardened armor. This added considerably to the tonnage, with a consequent reduction in speed. It remained for the naval architects to decide upon the proper balance to be struck between armor and armament, and speed.

The problem facing the naval architect in the design of a new type of ship may, in a homely way, be compared to the thrifty housewife who has a certain sum of money to spend. The displacement of the ship corresponds to the housewife's sum of money, and the designer can spend this displacement in many ways—fuel capacity, armament, armored protection, or speed.

Having a given tonnage displacement, the naval architect can only spend this amount, and it rests with him where it shall be allotted. The variations in a single type of ship show how radically these designers differ, just as the different homes in the same community vary in the disposal of their budgets. As the various commodities become cheaper, the housewife finds that her money can obtain much more. In like

manner, the naval architect finds that improvements in guns, in motive power, and in armor, enable him to obtain more offensive and defensive qualities for each ton of displacements expended.

The design of vessels of this period was affected to quite a degree by the results of the Russo-Japanese War. Most naval authorities agreed after the fleet engagements in this war, that the fastest fleet had won in each instance, with the result that most ships built immediately following this war sacrificed some offensive and defensive power to the apparent all-important quality of speed. The increases in the speed of vessels of this time were helped greatly by the advent of the steam turbine and the water-tube boiler with superheaters.

The *Florida* and *Utah*, sister-ships, carried ten 12-inch, 45-caliber guns in their main batteries, and sixteen 5-inch, 51-caliber guns as secondary. Their designed speed was 20.75 knots and the tonnage was 21,825, normal displacement. Both of these ships used the steam turbine, and employed four propellers. The *Wyoming* carried twelve 12-inch, 50-caliber guns in her main battery, and twenty-one 5-inch, 51-caliber guns as secondary. Her tonnage was 26,000 and the designed speed was 20.5 knots, using turbines connected to four propellers.

In the question of speed, the United States was the first country to set a limit on the dreadnought's speed, and was apparently satisfied with a speed of about 20 knots. On her trials the *Florida*, however, attained a speed of over 22 knots, which labeled her as the fastest battleship in the United States Navy, and during her service of almost nineteen years, she maintained this honor. After her modernization in 1926, she was credited with a speed of 22.3 knots.

Upon being commissioned in 1911, the *Florida* served with the Atlantic Fleet until 1914, when she was ordered to Vera Cruz, Mexico, during our intervention in that country, and remained in Mexican and Cuban waters until 1914-15.

Rejoining the Atlantic Fleet in 1916, she was attached to Battleship Division Seven, Squadron Four, serving in that status after the entry of the United States into the World War and until November 13, 1917. During this first period of the war, she operated in the Chesapeake Bay area.

On November 13, 1917, Rear Admiral Hugh Rodman assumed command of Battleship Division Nine, composed of the following ships:

New York, Flagship, Captain C. F. Hughes.

Delaware, Captain A. H. Scales.

Florida, Captain Thomas Washington.

Wyoming, Captain Henry A. Wiley.

These ships were immediately fitted out for distant service, crews augmented, stores received on board, bunkers filled, a final coat of paint applied, and on the afternoon of November 25, 1917, the division left Lynnhaven Roads, Virginia, for European waters. The voyage across the Atlantic was without special incident, except for the normal war-time routine of extra watches and lookouts, and the natural tenseness of entering the submarine infested war zone.

Arriving at Scapa Flow, Scotland, on December 7, 1917, they were given a rousing welcome by the ships of the British Grand Fleet based at that point. After a week of preparation, which included studies of British codes, war plans, and tactics, and plain fraternizing, the American division was assigned as the Sixth Battle Squadron, British Grand Fleet, and was given the position of Fast Wing.

Operating with the Grand Fleet with bases at Scapa Flow and the Firth of Forth, Scotland, until the end of the war, the American division encountered five submarine attacks; put to sea twice with the Grand Fleet with the expectation of meeting the German High Seas Fleet; and on one occasion while in company with the Grand Fleet, contact was made with the German Battle Cruiser Squadron, although no action resulted. During two of the submarine attacks, the *Florida* was forced to leave the division formation, maneuvering to avoid torpedoes which barely missed her.

The surrender of the German High Seas Fleet occurred off May Island, which guards the entrance of the Firth of Forth. The Grand Fleet, including the U. S. Battle Force, got under way during the night of Wednesday-Thursday, November 20-21, 1918, and proceeded to a point about forty miles east of May Island. The German Fleet was met, and led by a British light cruiser, escorted on a westerly course in single column between the two columns of the Grand Fleet. The ships of the Ameri-

can division were assigned to middle position in the north line between two British squadrons. The American division was at this time composed of the *New York, Florida, Wyoming, Texas* (joined squadron February 11, 1918), and *Arkansas* (relieved *Delaware* July 30, 1918).

The Ninth Division sailed for the United States on December 14, 1918, after escorting President Wilson in the transport *George Washington* from the south of the coast of England into Brest, France, and arrived in New York on December 26, 1918.

With the *Florida* stricken from the Navy list, we find that this will mark the first time since 1861 that the United States Navy has not either had a *Florida* in her list of ships, or the design of a ship with that name reserved for her.

A side-wheel steamer of 1,261 tons first carried the name of *Florida.* She was purchased from S. L. Mitchel and Company, of New York, on August 12, 1861, and had the following characteristics: 214 feet long, 35 feet 3 inches beam, 22 feet 4 inches draft, and had a maximum speed of 12.5 knots. Immediately following her purchase, she was fitted out as a warship carrying the following guns: four 57-cwt., 32-pounders; four 42-cwt., 32-pounders; and one Parrott rifle, 20-pounder.

This first *Florida* was modernized in 1863, and her armament then included four Dahlgren smooth bore 9-inch guns; one Parrott rifle, 100-pounder; one Dahlgren rifle, 50-pounder; and one rifle, 12-pounder. Her modernization at that time was just as important, if not more so, than the modernization of the last *Florida* in 1926, at a cost of more than $3,000,000.

Upon her commissioning, Commander J. R. Goldsborough, United States Navy, became her first commanding officer, joining the ship on October 5, 1861. On October 16, 1861, the *Florida* put to sea, and proceeding to Port Royal, South Caralina, joined the other vessels in the blockade of the Confederate states coast line. The *Florida's* service in the Civil War carried her from the Florida Keys to Halifax, Nova Scotia, and extracts from her log show that she took part in the following engagements: September 25, 1862, captured the steamer *Agnes;* July 11, 1863, captured the steamer *Calypso;* June 21, 1863, captured the schooner *Hattie;* February 3, 1864, assisted in destroying the steamer *Wild Dagrell;* February 5, 1864, assisted in destroying the steamer *Westfield;* February 10, 1864, forced the side-wheel steamer *Fannie and Jennie* and the screw steamer *Emily* ashore, after which boats were sent inshore to capture them, but the Confederate shore batteries opened fire with artillery, doing heavy damage to both grounded steamers and slight damage to the *Florida;* March 6, 1864, rescued crew of 109 from the steamer *Peterhoff* which was destroyed by enemy fire; April 24, 1865, forced the Confederate steamer *W. H. Webb* ashore and destroyed her.

The first *Florida* was sold in 1868, and the steam frigate *Wampanoag,* built at the navy yard, New York, at a cost of $1,575,643 succeeded her, when her name was changed to *Florida* on May 15, 1869. The second *Florida* was 355 feet long, 45.5-foot beam, and drew 19 feet of water.

The keel of the third *Florida* was laid at Elizabethport, New Jersey, on January 23, 1899, and when commissioned was classed as a "coastwise defense monitor." Her main battery consisted of two 12-inch breech loading rifles in a single turret, and her secondary battery of four 4-inch rapid fire guns, three 6-pounder rapid fire guns, five 1-pounders and two Colt guns. Her name was changed to the *Tallahassee* on June 20, 1908, to release the name *Florida* to the battleship recently retired from service. The *Tallahassee* later served as a submarine tender in the Atlantic Fleet.

The *Wyoming,* stricken from the list of active ships in accordance with the London treaty, was the first twelve-gun dreadnought of the United States Navy, carrying twelve 12-inch, 50-caliber guns in her main armament, and twenty-one 51-caliber, 5-inch guns as a secondary battery. Her length was 562 feet, beam 93 feet 2.5 inches, displacement 26,000 tons, draft 28 feet 6 inches, and her speed 21.3 knots. Her engineering plant has as motive power, twelve B. and W. boilers equipped with superheaters, and four Parson turbines working on four propellers.

The first *Wyoming* was a steam sloop of about 997 tons, built at the navy yard, Philadelphia, in 1858, at a cost of $323,527. Using screw propulsion, she had a maximum speed of 10.5 knots and a cruising speed of 7 knots. Her armament consisted of two 11-inch pivot guns, four 32-pounders, and

one 12-pounder. She carried a crew of 21 officers and 193 men.

Little did the yard workmen think of the future glory that was to be the *Wyoming's* while they were forming her wooden hull, nor could the most imaginative of them picture the voyages-to-be of this diminutive sloop. Their work, however, was as carefully performed as if they were aware of the many assignments that were to be hers, for she sailed the seven seas until 1882, stood the brunt of unheard-of odds in action, and finally in the autumn of her career served as an inspiration to the naval cadets at Annapolis, where she was used as a training ship.

Her first cruise took her to Panama in 1859, under the command of Commander John K. Mitchel. In 1862, after visiting Nicaragua, Panama, and Peru, she arrived in the East Indies with Commander David McDougal as her commanding officer. In this service, the *Wyoming* was to search for and seize, if possible, any Confederate privateers in the waters of the Orient.

During this period, events rapidly transpired in Japan so that a foreigner's life was very insecure. The interpreter of the United States legation, a Mr. Heusken, was murdered in the streets of Yedo, in 1860. The Japanese government punished the native attendants of Mr. Heusken, and the guard on duty in the vicinity of the murder. The sum of $10,000 was also given to the mother of Mr. Heusken.

On July 5, 1861, fourteen Japanese, belonging to the party known as *Daimios,* who were violently opposed to foreigners and were acting contrary to the wishes of the Japanese government, attacked the British Legation, wounding two of the members. Mr. Townsend Harris, Minister Resident from the United States, was largely responsible in the securing of prompt apology and redress on this occasion.

Further hostilities of the *Daimios* having culminated in separate attacks on vessels bearing the flags of the United States, Holland, and France, the United States Minister to Japan requested that the *Wyoming* (then in the vicinity of Hongkong) come to Yokohama.

The American steamer *Pembroke* was attacked by armed Japanese government vessels on June 25, 1863, while going from Yokohama to Shanghai via the Inland Sea and Nagasaki. She ran out of range of the firing and escaped through the Bungo Channel. The captain of the *Pembroke* stated that he had received no notice not to make the voyage that way. The American house of Russell and Company, in China, presented claims through the United States Minister to Japan, Robert H. Pruyn. The governor of the Japanese province was sent for by Mr. Pruyn, the claims presented, and our minister stated that the insult offered to our flag was a much more serious matter than the damage to the ship; that he proposed a visit to Nagasaki in the *Wyoming* and, on his return, would expect to receive a communication from the Japanese government in relation to the serious offense.

A further statement of Mr. Pruyn reads that "at the close of the interview with the governor, I had a conference with Commander McDougal, as to the proper course to pursue, and was gratified to find that he had decided to proceed instantly to the straits, for the purpose of seizing and, if needful, destroying the two vessels that had attacked the *Pembroke.*" Again in the same letter he adds, "It appeared to me that if the outrage was not promptly punished, great encouragment would be given to the hostile *Daimios,* and our inaction attributed to either fear or weakness; and then an alliance be formed by them, which would eventuate in hostilities with all Japan."

On July 16, 1863, the *Wyoming* proceeded to the Straits of Shimonoseki, and upon approaching the town, she was fired upon by the forts. This fire was returned by the *Wyoming,* and after engaging and disabling the armed brig *Kosei* (which had attacked the steamer *Pembroke*) under a heavy fire from the forts, she went aground. Her position seemed hopeless but, by means of her sturdy engines and propeller, Commander McDougal finally worked her loose. At this moment the Japanese steamer *Koskin* slipped her cables and headed for the *Wyoming,* evidently intending to ram and board her, but the American sloop headed straight for the *Koskin,* firing as she went, and the second shot from the *Wyoming's* bow gun struck the Japanese ship just above the water line, crushed her boiler, came out through the other side, and finally exploded in the town. The wound received by the *Koskin* caused her to sink in a few moments.

The *Wyoming,* during this engagement,

was under the fire of three ships, and at one time or another, of eight shore batteries. Before withdrawing, however, she had sunk two of the ships, injured the third, disabled one of the shore batteries, and silenced several of the others! Opposed to the six guns carried by herself, were not less than ninety-two and some of these were of heavy caliber. The *Wyoming* was struck many times, having been hulled ten times, her smokestack struck six times, and four of her crew killed and seven wounded.

There is not a similar single achievement anywhere in the annals of our Navy. Commander McDougal, according to one of the crew of the *Wyoming*, had run a train of powder to the magazine, well knowing the consequences of capture by the almost barbaric *Daimios* in case the little sloop failed in her gigantic undertaking. It is to the credit of the *Wyoming's* courageous captain and crew, and to the painstaking shipbuilders, that this powder train was never used.

American, French, and Dutch vessels made an attack on the Shimonoseki forts in 1864; troops were landed and gained possession of the batteries. Hostilities soon ceased, and an agreement was made with Prince Nagata that the ships of all countries passing through the straits should be treated in a friendly manner.

The *Wyoming* returned to the United States, overhauled at Baltimore, and rejoined the Asiatic Squadron in 1866. After a second tour of duty on this station she returned to Boston, Massachusetts, later leaving for a cruise to Panama. In 1873, she was sent to Santiago de Cuba in connection with the *Virginius* affair.

In 1878, the *Wyoming* was assigned to the European station, taking over articles for the Paris Exposition, and she remained in European waters until 1881. During her tour of duty on this station, she visited all of the principal Mediterranean, Atlantic, and North Sea ports. After returning to the United States she became the station ship at Annapolis in 1882, and was finally sold in 1892.

The second ship to carry the name of *Wyoming* was a monitor of 3,225 tons carrying sixteen guns. She was built at the Union Iron Works, San Francisco, California, and was launched in 1900. The second *Wyoming* was, upon commissioning, assigned to the Pacific Squadron. Her name was changed in 1908 to the *Cheyenne*.

The *Utah*, designated as the ship to be retained as a "target ship" under the terms of the London treaty, was in Cuban waters operating with the Atlantic Fleet when the United States entered the World War. Returning to the Chesapeake Bay area, she remained with the fleet until August 30, 1918, when she sailed for European waters, with Admiral H. T. Mayo, Commander in Chief of the Atlantic Fleet, and members of his staff on board, who were en route to Europe for important conferences and inspections.

Eleven days were required for the trip across, during which huge seas and heavy gales were encountered. Whaleboats were carried away, motor and steam launches crushed in their skids, waves swept the decks, and water found its way into the engine-rooms, but through it all the engines were kept turning over for 15 knots, and upon entering the submarine zone, the speed was increased to 20 knots.

The *Utah* finally dropped anchor in the fortified harbor of Bantry Bay, Ireland, on September 11, 1918. Her mission was to guard against the possible escape of German light cruisers from the North Sea, and in case of their escape to protect the troop and material transport lanes from their raids. Her position in Bantry Bay afforded a short cruise to the most used transport lanes, and to the European terminals of our convoys.

The *Utah* steamed a total of 17,900 sea miles during the time that the United States was a contestant in the World War. Her total cruising since being commissioned amounts to approximately 350,000 miles, and although she was overhauled and modernized in 1926, her mileage would, to some of the "automobile-minded," warrant "turning her in." The "Big 'U' " has, during her commission, won at one time or another every competitive trophy in the fleet, including the engineering trophy for 1929-30, her last year of competition.

When built, the *Utah* was the utmost in battleship construction, her main battery consisting of ten 12-inch guns, mounted in five center-line turrets. Her engineering plant was the first to boast a successful large turbine installation combination with water-tube, coal- and oil-burning boilers, and dur-

ing her first competitive year she won the engineering trophy.

The *Utah* at various times was the flagship of the Commander in Chief, Atlantic Fleet; Commander Battleship Force and Division Five; and Commander Naval Forces Europe.

In December, 1928, President-elect Hoover with his party returned to the United States on board the *Utah,* upon the completion of his South American tour.

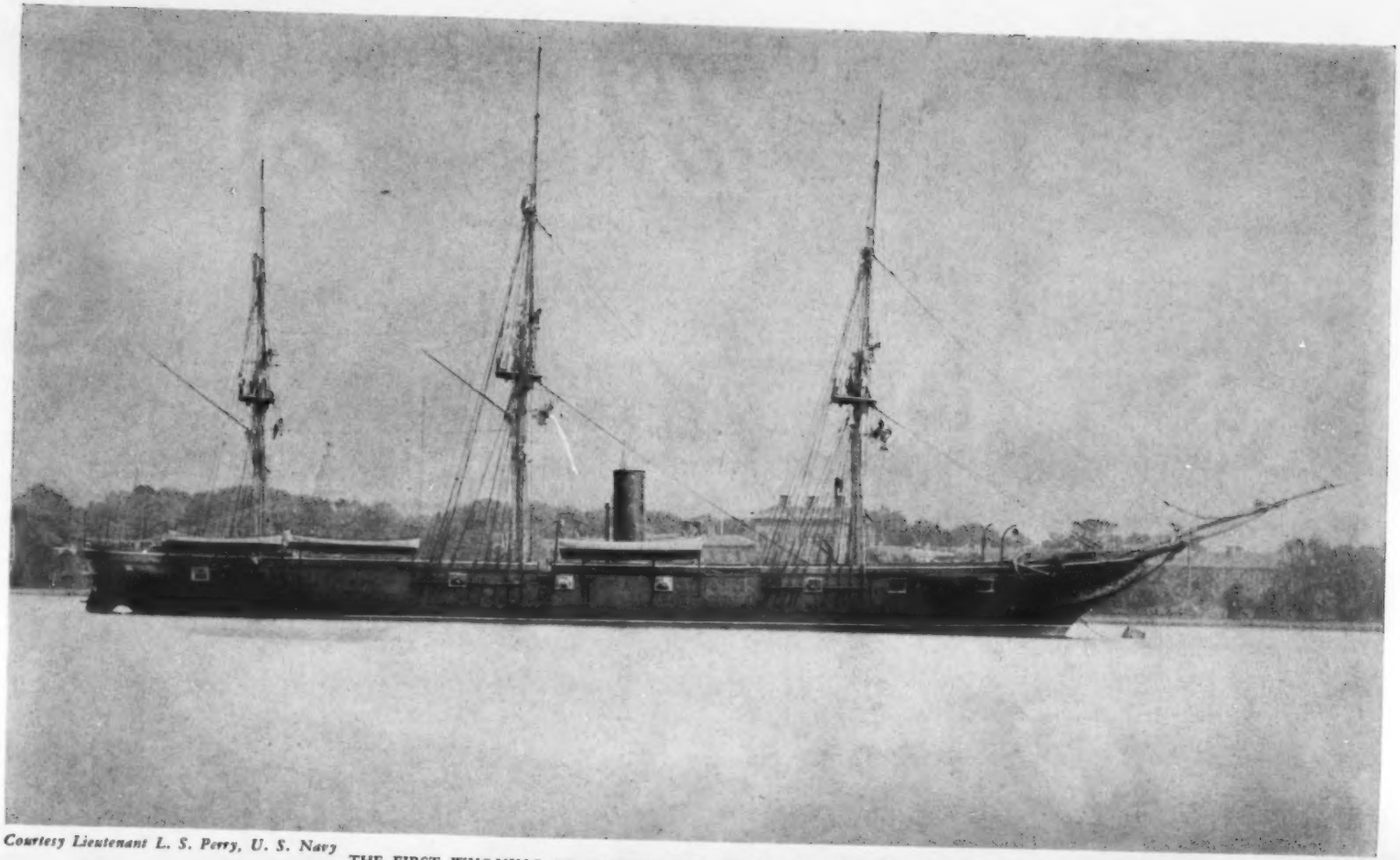
After the conclusion of hostilities in the World War, the *Florida, Wyoming,* and *Utah* rejoined the Atlantic Fleet, and upon the reorganization of the fleet in 1919, all were assigned to the Scouting Fleet.

All three of these vessels were recently modernized, when the time-honored cage masts were replaced by military and tripod masts, blisters riveted on their sides, oil-burning boilers installed, and gun elevations increased. The cost of modernizing these three vessels was over $3,000,000 each.

The passing of these ships from the active list of the Navy will bring back memories to many service and former service men —memories of the newly commissioned ship, the pride of the Navy; of foreign cruises; of war-time service; of trophies won by work and play; of the "new leases on life" for the ships when modernized; of the never-to-be-forgotten shipmates of former years; and to the last crews, the memory of the farewell target practice which brought to a close the careers of America's first superdreadnoughts.

Courtesy Lieutenant L. S. Perry, U. S. Navy

U.S.S. *WYOMING*—MONITOR LAUNCHED IN 1900



Courtesy Lieutenant L. S. Perry, U. S. Navy

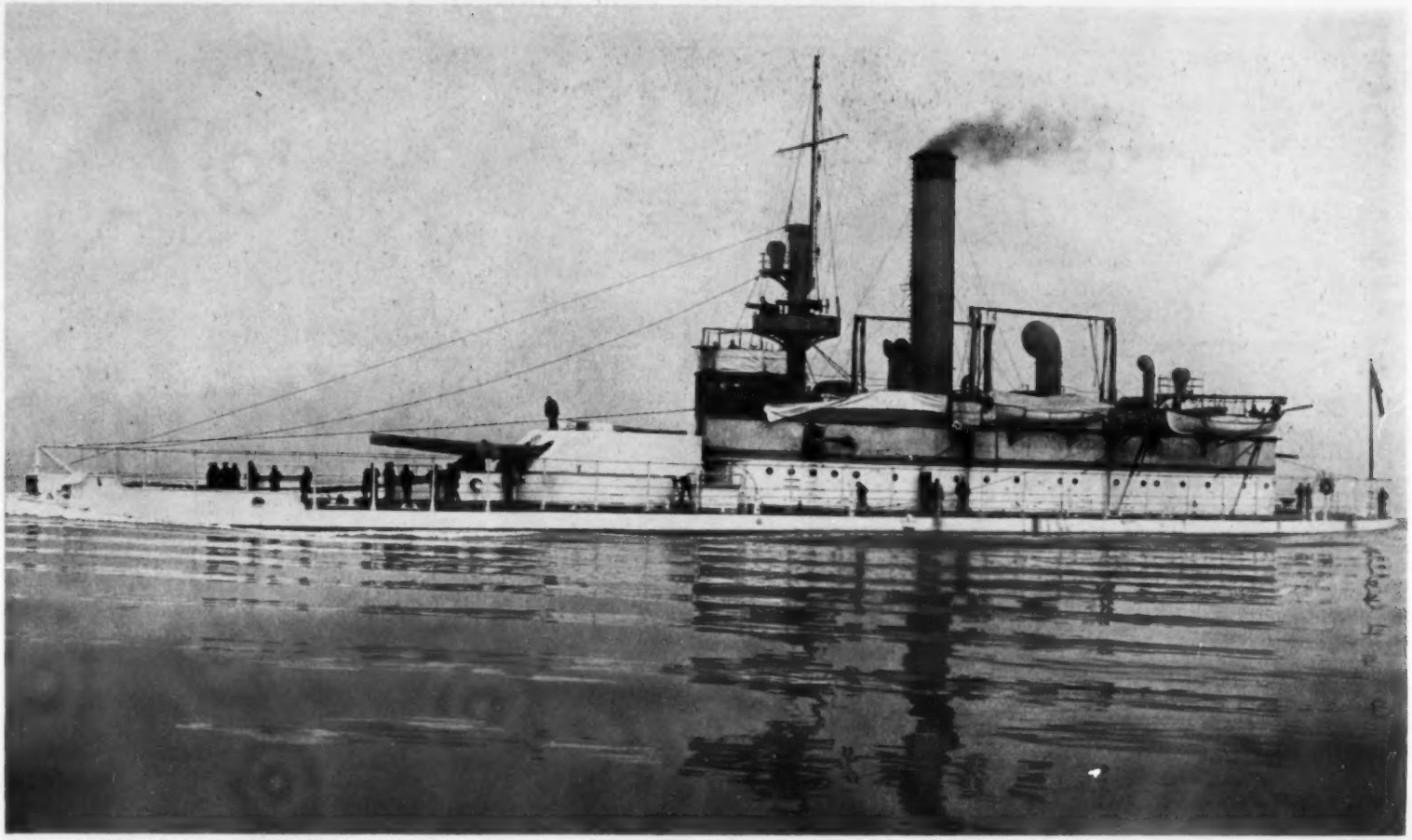
THE FIRST *WYOMING* AT ANCHOR OFF THE NAVAL ACADEMY, ANNAPOLIS

THE FIRST *WYOMING* AT ANCHOR OFF THE NAVAL ACADEMY, ANNAPOLIS

Courtesy Lieutenant L. S. Perry, U. S. Navy

From a photograph of a painting taken by Clary Ray

STEAM SLOOP *WYOMING*, BUILT IN 1854



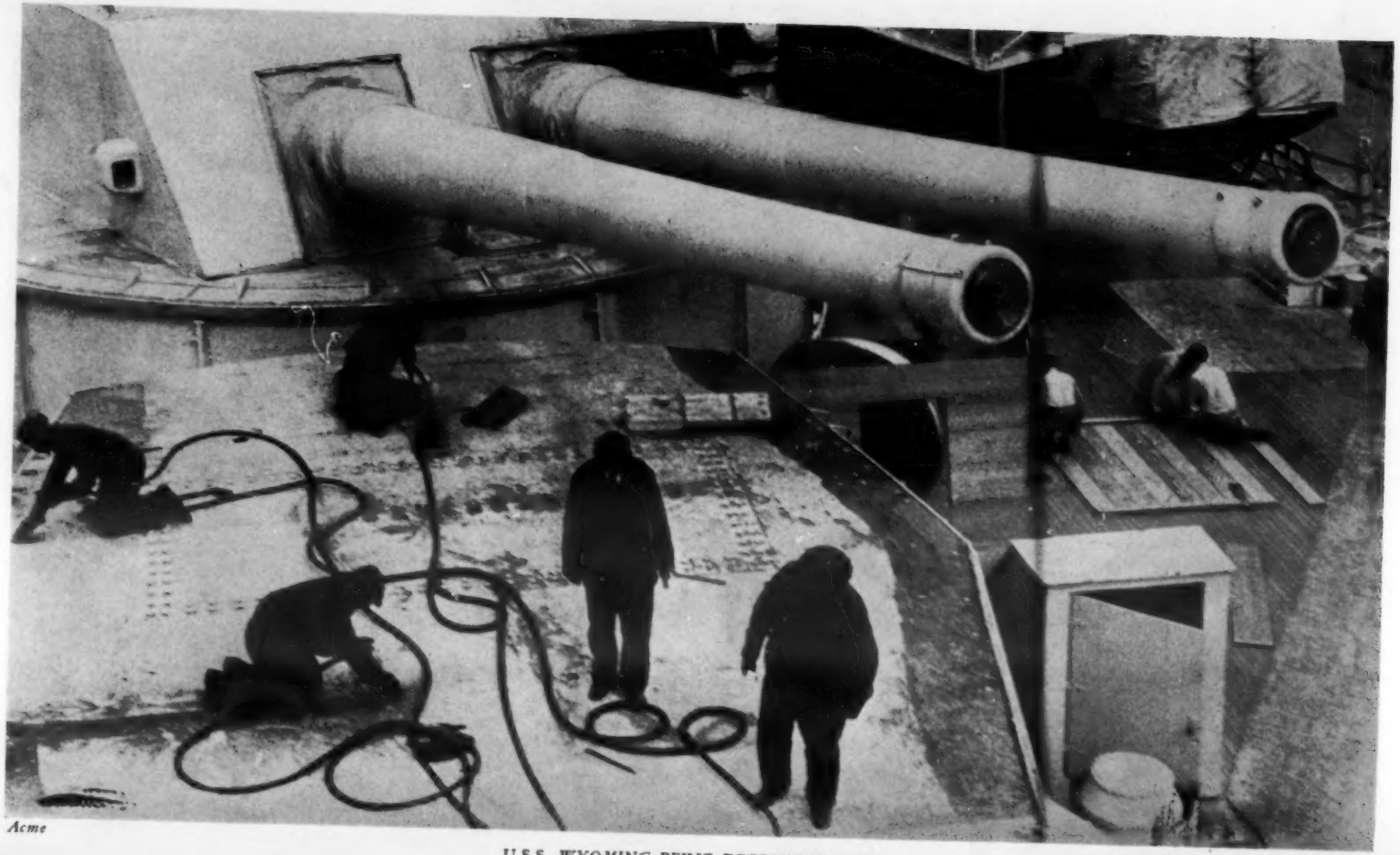
Courtesy Lieutenant L. S. Perry, U. S. Navy

U.S.S. *FLORIDA*, COASTWISE MONITOR
This was the third vessel of this name.

This was the third vessel of this name.

Courtesy Lieutenant L. S. Perry, U. S. Navy

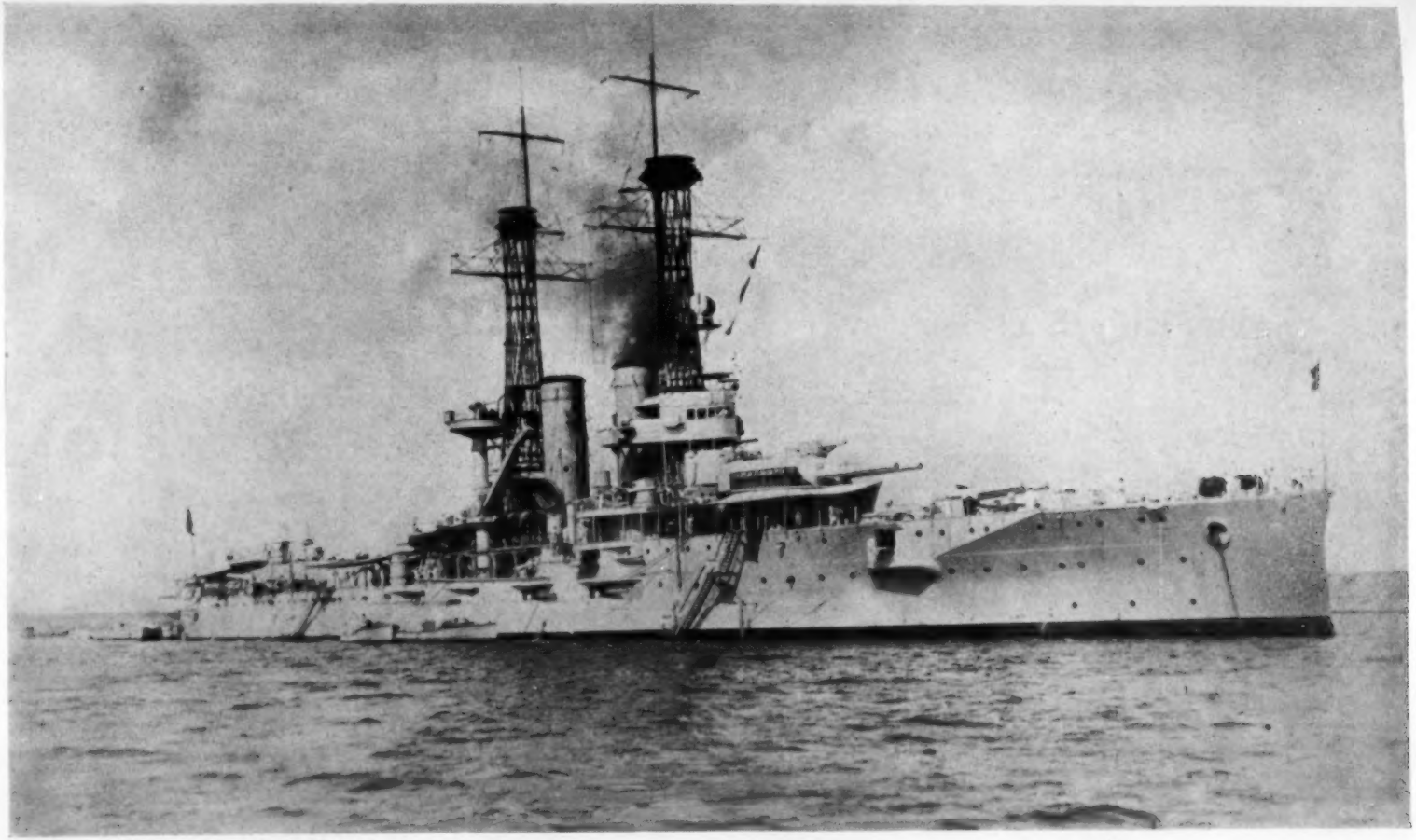
AIKEN'S LANDING, VIRGINIA, SHOWING THE U.S. MONITOR *ONONDAGA* AT ANCHOR IN THE JAMES RIVER



Acme

U.S.S. *WYOMING* BEING DECOMMISSIONED

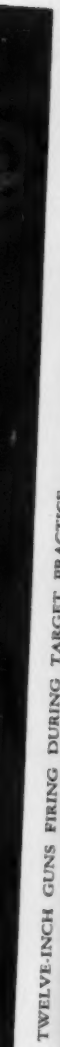
U.S.S. *WYOMING* BEING DECOMMISSIONED



Courtesy Lieutenant L. S. Perry, U. S. Navy

U.S.S. *FLORIDA* PRIOR TO MODERNIZATION

TWELVE-INCH GUNS FIRING DURING TARGET PRACTICE



FITNESS RECORDS AND SELECTION FOR PROMOTION

By Commander Charles M. Cooke, Jr., U. S. Navy

Editor's Note: The views expressed in this article represent the opinions of the author and should not be taken as official or even as semi-official.

IN PROVIDING for the selection for promotion of line officers of the Navy we are confronted with two requisites. First, we must provide for the elimination of the unfit, and the promotion of only the fit, and of those the fittest, and second, we must strive to adjust the increase in rank and responsibility of the officer to the natural development of his capacity and ability so that they will mutually react to the best advantage of the officer and the naval service.

It can be readily seen that the second requisite may operate to prevent the promotion of all the fit. However, it is believed that service opinion supports the limitations imposed by the present personnel laws that the *limiting* age for lieutenant commanders should be from forty-one to forty-five, that of commanders from forty-eight to fifty-two, and that of captain from fifty-five to fifty-nine. These are the maximum ages at which officers may become commanders, captains, and rear admirals, or put on the promotion list therefor. It is believed that the average age of promotion into these ranks should be lower than these maxima. Future prospects indicate, however, that they will be the actual ages of promotion. Certainly they should be no higher.

And yet, when we operate selection to properly provide for these limitations, having due regard for "the fitness of the officer and for the efficiency of the naval service," officers will be passed over whom the service regards as fit for promotion. It should be our effort to provide a selection machinery which will insure, to the greatest degree practicable, that those passed over are the least fit of those in the block of selection.

Subsequent to the passage of the selection law in 1916, our expanding strength of regular line officers obviated for many years the necessity for drastic elimination in the grades of lieutenant commander and commander. In 1930, we became immediately confronted with the necessity for drastic elimination in the grade of lieutenant commander. Within a few years this condition will also apply to the other upper grades.

Selection boards are enjoined and take oath to base their selections on the comparative fitness of the eligible officers and the *efficiency of the naval service.* That this has been done with the highest degree of industry, ability, and integrity of which selection board members are capable cannot be doubted. That the selection machinery has been of vast benefit to the service, and will so continue, even if not improved, is equally obvious. But it is not so much selection boards themselves with which we are here concerned. It is the tools with which they have to work—officers' fitness records.

Fitness reports are made out at least twice each year. Each report contains a comparative (as by a numerical mark), or absolute (as by the use of descriptive adjectives), estimate by the reporting officer on each of about twenty characteristics of the individual. During the period of the report the reporting officer may have had an opportunity to closely and extensively observe some or all of these characteristics, he may have had opportunity to observe them only at a distance, or he may have had opportunity to observe not more than a few of them. If he has marked them before, in many cases he will forget the mark given. In uncertain cases he will tend to favor the officer.

As the officer is a shipmate, a friend, and will probably, sooner or later, see the report, in most cases he is favored anyhow. In the case of a subordinate shipmate, it not infrequently happens that senior subordinates perform their duties with that modicum of efficiency and zeal which neither completely

satisfies nor dissatisfies, which does not warrant an unsatisfactory report nor a request for detachment. Many commanding officers feel that low fitness reports in such cases will have an adverse effect on the efficiency of the officer and the ship, and they tend to give good reports with a view to obtaining the best local results possible.

The examination of many hundred fitness reports taken at random shows that the average fitness report reports qualifications much above average. It seems highly probable that this will continue to be the case. Reporting officers are in general well aware that fitness reports are marked high by others, and they gauge their marks accordingly. Many feel that, if they do not, they will be subjecting their own officers to a comparative disadvantage. And so they will.

Reporting officers are also reluctant to make out unsatisfactory reports, especially on senior subordinate officers, involving as it does, the disagreeable task of referring the report to the officer, and in some cases the possible boomerang on the reporting officer. The attitude, character, personality, shortcomings, etc., of the reporting officer inevitably enter to a greater or lesser degree in the report, but the point to be considered here is that there exists a strong tendency and pressure to force marks from "unsatisfactory" to "average" or above, and to force "average" marks to "above average."

Fitness reports have been improved in the last few years, both in form of the report, and in the care and discrimination with which they are made out. But even now there is a preponderant tendency to give to officers who have rendered satisfactory duty a mark about two-thirds the way from unsatisfactory to perfect. In other words, much nearer to "perfect" than to "satisfactory."

This leaves small range for differentiation by selection boards (and for that matter by detail officers). Decidedly unsatisfactory officers are clearly marked and stand out. To some extent, also (but to a less degree than for the unsatisfactory) decidedly superior officers stand out. Fitness reports of the majority, however, do not, taken as a whole, indicate comparative fitness.

And yet any reporting officer who has reported on a number of officers eligible for selection should be, and is, in a good position to draw comparisons between them. If it becomes his duty to draw such a comparison between those who have performed duty under him, he will then be reporting on the relative fitness of these officers as between themselves, and the disturbing factors of high marking by others, of the difficult mathematical and absolute estimates of an officer's ability, are eliminated. If ten officers marked by him are being considered by the selection board this board endeavors to partially determine the relative fitness of the ten on fitness reports made out by him, some or most of which may show slight differentiation. Why should not the selection board have available for its consideration his estimate of the relative fitness of the ten? Each of these ten would appear on the lists of forty (more or less) other reporting officers compared with other officers also in the block of selection.

There is another aspect of fitness reports involving an inherent deficiency which is partially unavoidable. This is the restricted point of view of the reporting officer. Generally speaking the brightest sides of objects and persons are turned upward. A look from the side, or bottom, may reveal quite different characteristics. Topside of the ship may look fine, and the bottom rotten. A rug may not look so good from the bottom as from the top. Before buying either, the purchaser would have a look all around.

Reports on officers by juniors seem, however, to be impracticable. It is probable that the detrimental effect on a military organization would be greater than possible benefits to selection for promotion. But the nearer reporting officers are to those reported on the better their position for looking around under him, as it were. It would be beneficial therefore to extend somewhat the list of those qualified to report on the comparative fitness of officers for promotion to certain senior officers who have served with and over them but not as commanding officer, for instance an executive officer over heads of departments, a gunnery officer over division officers.

The selection law directs that selection board members shall take oath to base their selection solely on the relative fitness of all those eligible and the efficiency of naval service. The first of these requirements necessitates that the records of hundreds of those eligible be investigated. The second

operates to restrict the selection to a "block of selection" at the top. If this were not done, and the very best officers in all of the three to six Naval Academy classes eligible were taken, it would be necessary, the following year, to select officers previously passed over, and, obviously, results extremely detrimental to the efficiency of the naval service would be produced.

If we call on captains and senior commanders to compare the relative fitness for promotion of officers who have served with and under them, it will be necessary to indicate a restricted block of selection. The size of this block depends on conditions that will obtain in the grades for a number of years in the future. Perhaps this should be on the basis of seven years. Its size should probably not exceed one-seventh of the grade under consideration, and should perhaps be somewhat under that.

Let us say that a proper "block of selection" of lieutenant commanders to be selected for commander is found to be one hundred below the junior lieutenant commander already on the promotion list. An alphabetical list of the officers in this block together with those previously passed over would be sent to each captain in the Navy, and to each commander of a Naval Academy class for four or more years senior to the junior lieutenant commander already on the promotion list.

Each of these commanders and captains would indicate the officers on the list who had served with and under him on board ship or in a unit of forces afloat, and under him on shore, as a lieutenant or lieutenant commander (namely as an experienced officer), further indicating in each case the duty being performed by the reporting officer and the duty by the officer reported on (name of ship should be included in this). Of the officers in the selection block who have thus been shown to have served under and with him, and only those, he would indicate by numbers their relative fitness for promotion, number one being considered of the highest relative fitness. If a reporting officer were reporting on ten of the one hundred in the selection block, he would mark them one to ten *regardless* of seniority (the seniority is provided for by the restrictions of the selection block, and later by the selection board itself).

The number of reporting seniors (for lieutenant commanders) would be about 220 captains plus a varying number of commanders of 100 to 160, say a total of 360. If each of these reporting seniors finds that he should report on an average of twelve in the selection block of 100, then each officer in the selection block will have 360 x 12 ÷ 100 = 43 as the average number reporting on his comparative fitness for promotion. This forty-three would be senior officers, who had previously submitted upon him fitness reports or had assisted the commanding officer in doing so and they would include all under whom he had served during the preceding twelve years or so, except those who had been separated from the service or had been promoted to rear admiral.

It may happen that certain reporting officers find that the entire number that have served under them are of high caliber, and that, even though differentiations can be made on the basis of their fitness for promotion, they are all believed to be relatively high in the 100. But the low man on such a list will appear on forty other lists, and if, in the first case, he has been compared with very efficient men, on some of the other lists he will find himself compared with officers of a correspondingly lower efficiency, with the resulting improvement in standing that would counterbalance the first instance.

It may be said that certain officers who have continued for many years on the same type of duty will not be susceptible to a widespread comparison. This is true, but it is also true of the fitness reports.

Right here it must be emphasized that this procedure is not designed to replace fitness reports, nor to discard in any part the present selective process. It is designed to reënforce the present process so that adequate and properly considered differentiations can be available for the use of the selection board. Without such a reënforcement, the fitness reports are considered to be an inadequate basis upon which to determine (in selections to commander and captain) upon whom a forced, and inevitable, attrition must fall.

The need for some such reënforcement was recognized in 1919 when General Order 494 of August 7, 1919, was issued for obtaining data for the selection board meeting in October of that year. The first two paragraphs of that order are quoted herewith:

While the department is convinced that selec-

tion for promotion is now of great value to the Navy and has brought about a continuously increasing efficiency in the naval service, it is earnestly desired to improve, if practicable, the present method, and to eliminate as far as is humanly possible whatever may appear at fault. Criticism has been leveled at the written records of officers, in that the marks and remarks thereon in general are of high average; that it is difficult to establish a preference; that officers known to a member or members of the board may have an advantage of those who have not that acquaintance; that the written record is sometimes at variance with the service reputation; and that neither one nor all of the selection board may have a sufficient knowledge of all officers eligible.

In fact the greatest need of the board in the discharge of its duties is an accurate, comprehensive service opinion on all eligible officers. In an effort to obtain this opinion a consensus of opinion will be obtained for the information of the board which will be convened to recommend captains and commanders in October. Considered with and as a part of the records of officers, such opinions cannot fail to be of assistance to the selection board.

This general order provided that all captains and commanders (in the case of selecting of lieutenant commanders) should arrange insofar as practicable in their order of comparative fitness for promotion *all* those eligible for selection for promotion, and submit these lists direct to the selection board.

Apparently the procedure outlined in this order was not considered to be practical in operation, since it was allowed to lapse for succeeding boards. Three reasons for this failure are discernible.

First: The need for drastic elimination in the junior selections was not pressing at that time.

Second: Reporting seniors were called on to rate officers who had not served with and under them.

Third and most important: Reporting seniors were called on to rate all officers eligible on the sole basis of their comparative fitness. This procedure does not give due weight to the "efficiency of the naval service," which, as has been explained previously, necessitates "blocks of selection." Further, with the large number eligible (in the case of lieutenant commanders perhaps 600) the actual rating and utilization of reports obtained would be too bulky and cumbersome for successful results.

In the procedure advocated in this article, there would be (in the case of selecting lieutenant commanders) about 360 reporting seniors. Each of these would report on from eight to twenty in the "block of selection." Each officer in the block of selection so reported on would have his name appear on about forty lists submitted by reporting seniors. If his average rating is high, the selection board will have good reason to include him in their selection. If it is low, close to the bottom on the forty lists, the selection board will have a rather authoritative basis for his elimination.

Various means suggest themselves for the summarized consideration of the reports, none of them perfect. For instance, one reporting officer might have eight on his list and another one twelve. Both lists could be readjusted on a percentage basis so that number eight of the first list would become 100 and number twelve of the second would become 100. This would cause number two of the first list to have his number raised and number two on the second list would be lowered. It is probable, however, that these differences would be adjusted when all reports were considered.

Whatever method is used, the selection board would have available for its use the integrated service opinion of most of the seniors who had reported on the officer under consideration (reporting seniors who were or who had become rear admirals are not included, because nine of them will compose the judicial body that will consider the reports. This reason is not important, however, and they could be included. If a board of captains is instituted as recommended hereafter the nine members of the board could be specifically excluded).

These reports of comparative fitness should be regarded as confidential, should be made out by the reporting officer without reference to any other officer, should be forwarded to the Bureau of Navigation and delivered to the custody of the recorder of the selection board to be convened. (It is desirable that this recorder be the officer in charge of records in the Bureau of Navigation.) The reports should be entirely for the use of the selection board and should be sent in about one month before the meeting of the board.

One objection that may be advanced against the procedure outlined above, is that reporting seniors are drawing comparisons on officers for performance some distance in the past, whereas fitness reports are made out at the time. The answer is that if they do not remember well enough to have

definite ideas as to the relative fitness of the individual concerned the latter may be properly omitted from the list, or a number may be grouped together. However, they are apt to remember very well, and especially those of mediocre or unsatisfactory performance on the one hand, and those with excellent performance on the other hand.

Another objection that may be raised is in regard to the size of the "block of selection." Objectors will say that no one can accurately forecast the future need for elimination, and that if drastic selection blocks are indicated the future continuance in the Navy of individuals may be prejudiced to an extent later found to be unnecessary. The answer is that it is necessary to plan for the future in the light of the best knowledge available. We find it necessary to build fighting craft for a possible future war which may bring conditions that we cannot now foresee, but we cannot stop planning and building because of this uncertainty.

Furthermore, we soon again face the fact, recently temporarily postponed by the passage of the personnel bill, where Naval Academy classes come up for consideration for selection by one board only, a percentage to be selected and the remainder retired. We will then be faced with "blocks of selection" whether or not in accordance with well considered plans.

Finally, the selection board is not obligated to base their selections on this predetermined block of selection. They may exceed it, or they may not cover it. But if they do desire to cover it they will have more and better data than is now possible for doing so.

This procedure does not contravene either the spirit or the letter of the selection law. And its successful operation should serve to better carry it out. An opportune time to test its operation will be by the coming selection board which meets in May (this is being written March 16, 1931), and which will consider for selection at this time only lieutenant commanders, for a period of ten days.

This brings us back to the selection board itself. It is required to make its report of selections not sooner than ten days after its first convening. As a rule, if its work has not been interrupted by other duties, the report is made at the end of ten days. During this period, ten days or longer, the work is very arduous. Anyone who has forced his eyes to travel over voluminous records for days, perusing extraneous and pertinent matters, knows that at the end of about three days it is difficult to keep the eyes on the job of sorting and appraising.

In this connection, it is probably feasible to eliminate some of the extraneous matter. But individual fitness reports cannot well be integrated. If the qualities reported on are needed anywhere in detail, and in the original, it is by the selection board.

The law, as it stands, requires that the board be composed of nine rear admirals. It is essential that this should be the case for selection to the grade of rear admiral. It is desirable that the same board select to the grade of captain. It is essential furthermore, that the present authoritative prestige, as provided by a selection board for these higher grades, composed solely of rear admirals, should be maintained.

This necessity is not so apparent, however, in selecting for the grade of commander, and it is desirable that the work of the board as now constituted should be divided. Furthermore, a board of captains would probably be more familiar with the lieutenant commanders under consideration than would a board of admirals. It would be desirable that the law should be so altered as to permit the convening of a board of captains, concurrently or shortly after the convening of the admirals board, for the selection of officers to the grade of commander.

As I see it, the selection board is a non-continuous judicial body. It meets for a short period, makes a report which is invariably approved without change by the department, and is dissolved never to meet again as such. It is a non-administrative body, and is not responsible, as a board, for the utilization of the officers it is responsible for promoting. The writer of this article is not aware to what extent the administrative agencies of foreign navies are empowered to select officers for promotion, but believes that it is to a much greater degree than obtains in our own Navy. It seems probable that an administrative selection agency in our own case would be subjected to such a flood of importunities and aggressive activities both in and out of the Navy as to make it too difficult and disagreeable to operate successfully in practice.

On the other hand, can a board of even our most experienced and capable officers meeting briefly, buried under the voluminous

records of a thousand eligible officers, give adequate consideration to policies and problems obtaining over a period of years? If officers specially selected for important duties by the responsible personnel bureau, or other high authority, are passed over, and officers denied such assignment, because of unfitness, are selected for promotion, we would seem to have deficiencies in our procedure that need remedy. Of course, such cases are the exception, and they could not be wholly obviated by any process.

It does seem desirable, however, that the selection process should be brought into as close touch as practicable with the responsible administrative agency of personnel. This can probably best be done by the inclusion, as an ex officio member of the selection board, of the chief of the Bureau of Navigation, and in the event of a captain's board of selection, of the director of officer personnel.

It may be objected that the chief of the Bureau of Navigation would be a prejudiced judge, that in the first instance he would keep the officer from important assignments at sea, and in the second instance he would vote against his promotion for the lack of such assignment. The same objection might, however, be extended to other admirals, former chiefs of the Bureau of Navigation, and others in high command afloat and ashore who may have been in positions having to do in some degree with assignments of the officers under consideration.

As against these objections, well founded or not, the chief of the Bureau of Navigation, as an ex officio member of the selection board, is put in a position to bring to the attention of the board the policies and considerations that have guided and is guiding the department, to protect the interests of those who have conformed zealously to their part in the execution of these policies, and finally to better assist the board to a consistent judicious adjustment of the problems of promotion to the best efficiency of the naval service.

ACROSS THE CONTINENT BY AUTOMOBILE

By Commander Archer M. R. Allen, U. S. Navy

ONE of the most delightful ways to see our great country is to go by automobile from coast to coast. It is not an expensive way to travel and modern cars and roads are so much better than they have ever been before that if time allows it is an easy, reasonable, and attractive way to make the journey.

The distance can be driven in any time down to five days but this requires that at least three people drive, and no stops be made for sleep. This is a real hardship and few would care to make such a trip. With two driving it is possible by hard pushing to make it in eight days, but this requires an average of 400 miles a day, which is too much. In comfortable transcontinental driving from 250 to 300 miles a day is sufficient and on this basis the trip can be made in from twelve to fourteen days. A proper allowance is thirteen driving days and at least three days for rest at some points where the day can be spent in walking or playing golf. If three weeks can be given to the trip so much the better and, if on the eastern roads where the driving is smooth, better than 300 miles a day can be made, the time allowance on the western part of the trip where the roads are apt to be difficult will be increased; here too the scenery may tempt the travelers to make side trips.

The ideal time of year to make the run is in June. The southern routes through Texas are available all the year around and in the winter they are the only open routes. By June, however, most of the roads as far north as the Lincoln Highway are clear of snow and the mountain passes are open. In July and August all the routes are open but those up to and including the central routes are hot and dusty. In the winter all the central and northern routes are closed on account of the snow in the Rockies but in spite of this it is reported that hundreds of motorists each year get as far west as Reno, Nevada, before they learn that none of the roads over the mountains are passable.

It is generally conceded by experienced people that by far the best route, taking everything into consideration, is the National Old Trails route, particularly from Kansas City to Los Angeles via Dodge City, La Junta, Trinidad, Raton, Sante Fe, Albuquerque, and Route U.S. 66 from there west, a total from the east coast of about 3,157-3,400 miles, depending on the routes covered east of the Mississippi.

A more adventurous route on account of the possibility of bad stretches of road in the early summer is via the Lincoln Highway. It is generally prettier from a scenic standpoint but nothing is more beautiful than the "painted desert" in Arizona and no town more generally attractive than Sante Fe.

The great side trip on the southern route is to the Grand Canyon from Williams, 122 miles round trip; on the Lincoln Highway late in the month a detour from Rawlins may be made to the Yellowstone, returning to the main route either at Salt Lake City, Utah, or at Wells, Nevada. The latter, however, depends on the road conditions and should only be undertaken if the local reports indicate the roads open and cleared.

It is hard for easterners accustomed to open roads practically throughout the year to realize that even as far east as Nebraska in June the main highway may be undercut by a river and a section go out, completely closing that route to traffic for some time.

The roads and routes west of the Mississippi require more careful selection than east of the river because there are greater lengths of gravel road and in Kansas the famous "gumbo," a thick slippery coating of mud over all the country roads, can only be avoided on any route selected by good luck and a dry spring. It is possible sometimes to get through with chains but at others you must wait for a dry spell. As each year goes by more and more of the road is paved, but I venture to estimate that even with the incentive of the recent road construction rush to aid the unemployed it will be another ten years before the Lincoln Highway is paved from one coast to the other.

People from the thickly populated east where every town is connected by paved roads with every other do not fully appreciate the road problem in the far western states where you can travel sometimes for 50 to 100 miles without seeing more than a cabin or two. So it is not strange that even on the Lincoln Highway from Marshaltown, Iowa, west there are only short sketches of paved road until you get into California. The rest is mostly good gravel and every effort is made to put it into condition as soon as the ground thaws in the spring. The transcontinental busses use this route, however, and in places such as the stretch between Parco and Evanston, Wyoming, in June of 1930 the road was torn completely out with holes six inches to a foot deep. This is unquestionably the worst kind of road to drive over, for it looks well ahead and when you try to work up to speed you suddenly drop into a small deep depression which will frequently rack the car hard enough to break the springs. On the whole, however, the gravel roads are good and the stretches of very bad road cover a comparatively small part of the total distance.

As to your itinerary. The state automobile clubs or the A.A.A. will give you an excellent routing if you are a member and desire to follow their schedule. They make every effort to insure having available the very latest information, but on a fifteen-day trip unless you check up locally at every stop over from the Mississippi west you may have to retrace your steps several times, and it is far pleasanter to ride continually toward your objective and use the additional time for stop-overs or side trips in the more beautiful parts of the country. A good reasonably designed schedule gives you an excellent backbone to work on and prevents hard driving to make up time at the end.

The Rand McNally Auto Road Atlas for the current year has the best general planning maps, with one for distance and one for route numbers. The United States route numbers are now in place on practically all the main highways of the country and are without doubt the greatest motoring aid so far invented.

So many personal considerations governing route selections enter into the question, particularly east of the Mississippi, that it is hard to select any particular route from the Atlantic coast to the river, but after you pass the "Father of Waters," unless on a far southern route, you should go out through Omaha or Kansas City. West of these points more careful attention to the stops is desirable on account of the fact that in some of the towns the hotels are much better than in others. Here is where the National Old Trails road excels, for the "Harvey" system of hotels give uniformly good accommodations, the best meals, and good water. On the Lincoln Highway, however, there is a vast difference, and as much of the comfort of the trip depends on a good bath and comfortable bed at the end of a long day's run, this part of the trip should be well planned.

It must be borne in mind that the consideration of previous advertising and steady support of many hotels is necessary for the continued publication of the more regular automobile guides, so that if an up-to-date independent guide can be found it may give more recent and less biased information. Such a guide is the "Mohawk Hobbs" guide issued by the Mohawk Rubber Company and on sale at most tourist bureaus and news stands. Considerable experience with these guides has shown them to be very dependable and entirely based on carefully acquired data without fear or favor. The information is up to date, accurate, and full on all matters of primary interest.

Using this guide for the Lincoln Highway west of Chicago one finds good daily runs as follows:

Chicago to Cedar Rapids	231.5
Cedar Rapids to Omaha	288.4
Omaha to North Platte	309.6
North Platte to Laramie	280.2
Laramie to Rock Springs	230.8
Rock Springs to Salt Lake	199.5
	1,540.0

From Salt Lake to the coast the selection of a route to Los Angeles or San Francisco may be made on local information, but this must be noted: generally speaking, from this point the sooner you get into California the better. Roads in Wyoming and Nevada are all through sparsely settled and mountainous country and while every effort is being made to develop them it is naturally a slow process. Route U.S. 91, 751 miles through Las Vegas, makes a one day shorter run as far as distance is concerned but the trip down the San Joaquin valley is well worth the additional time if it is available,

and going via Sacramento the distance is only 1,089 miles, a difference of 338 miles.

The Victory Highway is of course the one usually taken, but by 1931 the road around Lake Tahoe should be in good shape and while the climb up from the lake to the top of the mountains is a steep and hard one the beauty of this route recommends it.

To Reno a good itinerary is as follows:

Salt Lake City to Elko	245.8
Elko to Reno	294.1

From Reno the direct route to Sacramento is 143 miles but via Lake Tahoe it is 169 and a comfortable run for that day would be to Stockton, a total of 217 miles.

The run from Stockton to Los Angeles, 361 miles, all over paved road can be easily made in one day or an intermediate stop may be made at any one of the delightful small inns on this route.

The run into San Francisco from Sacramento is only 99.4 miles and from Los Angeles to San Diego is only 130 miles.

Chicago, 715 miles from Washington or 865 from New York, can be made easily in three days running time and a recapitulation of the time and distance shows:

	Days	*Miles*
New York to Chicago	3	865.0
Chicago to Salt Lake	6	1,540.0
Salt Lake to Reno	2	540.0
Reno to Stockton	1	217.0
Stockton to Los Angeles	1	361.0
	13	3,523.0
To San Diego	1	130.0
Total	14	3,653.0

Driving three days and resting one is a good schedule so that this trip should take from sixteen to seventeen days, which is a good average trip across, without forcing.

All the best hotels have golf playing arrangements with golf clubs so that guests can arrange a game in any city. A day on a good golf course makes you feel in fine trim for next day's run.

Going by the Old Trails road the schedule works out as follows:

	Days	*Miles*
Chicago to Kansas City	2	510
Kansas City to Salina	1	207
Salina to Dodge City	1	241
Dodge City to La Junta	1	221
La Junta to Santa Fe	1	302
Santa Fe to Gallup	1	237
Gallup to Williams	1	190
Williams to Barstow	1	370
Barstow to Los Angeles	1	136
	10	2,414
New York to Chicago	3	865
	13	3,279

San Diego can be made on the last day, giving a total of thirteen days driving and a distance of 3,409 miles. The run from Williams to Barstow, 370 miles, is a bad day's work but is necessary for there are no good hotels in between. To Los Angeles from New York via Baltimore and St. Louis this distance may be reduced to 3,157 miles but again a matter of a hundred miles or more on a trip of this kind makes little difference.

Now as to accommodations and cost for two people. The first rule is to stay at European plan hotels if you are making a hotel trip, at tourist houses for less expense, and at camps and cabins for still less. In this schedule I will give only the best hotels on the above plan and figure meals as they cost in the best restaurants for very little is saved, particularly west of the Mississippi, by going to any but the best.

	Lodging	*Meals*
To Chicago ....(3x 6)	$18.00	(3 x 6) $18.00
Cedar Rapids	4.00	5.25
Omaha	5.00	6.00
North Platte	4.00	4.00
Laramie	4.50	4.60
Rock Springs	4.00	4.60
Salt Lake	4.00	5.00
Elko	3.50	4.60
Reno	3.50	5.00
Stockton	4.50	5.00
Los Angeles	4.50	5.00
Totals	$59.50	$67.05

A safe allowance is $10 a day for two people for lodging and meals.

Gasoline varies in price. In 1930 it ran from $0.33 in Nevada to $0.18 in Wyoming, the average being $0.24. As it takes with the usual modern car about 250 gallons the cost is about $60 for the best grade. Tires should be good and the trip takes from one-fifth to one-quarter of their mileage or about $12 worth of wear unless you have a bad break. With about one gallon of oil per 300 miles the oil is a small item, in round numbers about $12. Repairs depend upon the age and care given the car. Everything should be kept in best condition for particularly in the far west the stretches between garages are long and towing expensive.

The totals are therefore something like this:

Food and lodging	$130.00
Gasoline	60.00
Oil	12.00
Repairs, upkeep, storage, etc.	40.00
Incidentals—movies, golf, etc.	65.00
	13)307.00
Daily	$ 23.62

By cutting down on the incidentals and by using the camps and cabins, which in the west are frequently very good, considerable saving can be made but more time will be required on account of buying, cooking, and handling meals.

In this way the total daily cost can be reduced as low as $15 a day for two people. However, unless you know how to camp and have good equipment this method of making the trip is not recommended. A safe estimate on your money allowance for the trip is $12.50 per person per day. Travelers' checks in units of $25 are by far the best means of carrying money.

For a sixteen-day trip for two people this means $400. Railroad travel from New York to Los Angeles costs as follows:

Fare (2 x 110)	$220.00
Berths to Chicago	17.00
Compartment	67.00
Meals	40.00
Tips, etc.	10.00
	$354.00

The train trip takes five days and as you must pay for your living for eleven days to make the time equal, at a rate not less than $10 a day for two people, the cost for the same period of time as the trip, sixteen days, will be $354 plus $110 or $464. The trip via Panama costs $550, first cabin for two people, and takes two weeks, but by neither of these routes do you get your car immediately available or without additional cost for transportation.

The wear and tear on the car and tires is not excessive and while it is difficult to put into dollars and cents, looks something like this:

Car Original cost	$1,600
Probable life 5 years or 60,000 miles	
Value at end	$ 200
Depreciation	$1,400
Per year—12,000 miles	$ 280
Run—3,000 miles	
Value taken from car	$ 70
Value taken from tires	$ 12
	$ 82

For a cheaper car:

Original cost	$500.00
Probable life—3 years or 36,000 miles	
Value at end	$ 50.00
Depreciation	$450.00
Per year—12,000 miles	$150.00
Run—3,000 miles	
Value taken from car	$ 37.50
Value taken from tires	$ 4.00
	$ 41.50

Good weather is, of course, the greatest single asset for a comfortable trip and in June the chances are usually the best. In 1928 and 1930 in that month there was very little or no rain on the trip. With the modern closed car, however, except for the road conditions rain makes little difference.

It is well to carry luggage in as few bags as possible as they must be handled in and out at night or locked in the car. Luggage should be carefully packed so that it does not chafe, as a day's run on a dusty rough road soon rubs a hole, unless care is exercised. Adhesive tape put on temporarily at points of contact will save both car and bags. Good sun glasses are a necessity to prevent headaches and they should be used right from the start. A small driving pillow for the small of the driver's back gives the spine a comfortable curve, and prevents pains in the back of the neck at the end of a long day's run. For the far west a good thermos of water is necessary and for the Old Trails road some good grade of non-alkaline water will be found very necessary even in some of the hotels in Arizona and New Mexico.

This schedule and the suggestions contained herein were obtained from the records of two transcontinental trips which were both easy and comfortable. It is hoped that the information will be found accurate and useful and that it may encourage others to "See America First," as in no other way do you get as fine an appreciation of the extent and variety of the people, climate, and scenery in this wonderful country in which we live.

SHIP PERSONNEL AND GAS WARFARE

By Lieutenant (J. G.) E. M. Ellis, U. S. Navy

THE problem of war for a navy has so far through the ages been solved by destruction of the material of enemy battle machines to such a degree that personnel operating them can no longer make them function. Examples of successful naval combat show that the proper armament to use, to obtain an enemy defeat, is a battery of guns that have such an enormous striking force that the best production in naval architecture can be easily smashed. With this as a criterion, polished plans are formulated, and meticulous preparations are made for the coming upheaval, from careful study and painstaking development of phases of previous engagements. However, every war is different from the one for which experts make plans. The thought process that works the operative mechanisms of the mailed fist, becomes so fogged with the demand for precedent, that it is unable to keep its practice entirely up with the march of events. This is not because the basic principles of tactics change, nor are new principles invented, but because of simple application of modern utilities to modify older methods. There is a very far-seeing English writer, Colonel J. F. C. Fuller, who has a reputation for being rather liberal in his views. He seized upon chemicals, aëroplanes, and tanks as the three outstanding developments of the World War. These factors in particular caused the World War to be characterized by a series of upset calculations.

A paragraph from a book by Colonel Fuller, *The Reformation of War,* is quoted as follows:

> Those of us who believe in the inevitability of war are nevertheless apt to think, as great wars only occur at about fifty year intervals, that, whatever changes science may demand, we have ample time to rest before setting to work to discover what the next war will require. No assumption could be more falacious, for, before a new military idea is accepted, a whole school of obsolete ideas, religious in their intolerance, has to be converted to the new idea, and not until it is converted will efficient training take place, and training is an all-essential to victory. If the truth must be known, should the next great war explode in 1972, then, if we work hard, we may just be able to convert the traditional school in time and replace it by a school of military scientists. Not brawny halberdiers skilled at the game of push of pikes or push of bullets or push of shells which strike down fool and sage alike; but intelligent thinkers who will push their ideas to the detriment of the enemy's beef, who will pit brain against muscle, and, if opposed by muscle alone, will win a war quite possibly in a night without a day.

Careful consideration of what the author of the preceding paragraph sets out makes us believe that research in the chemical industry may show a path to the direction in which science is forcing warfare. The use of chemical agents may be the next step in military evolution. It is perfectly possible that in a single test tube may be found the conquest of the world. What type of chemical this might be is not known, but it seems that some knowledge of the subject is desirable. Military men should overcome any distaste that they might have for the use of chemical agents in connection with their profession. If in future wars, we are to avoid gross mismanagement in the high places, and panic, plus stupidity in the rank and file, it is essential that every one should make some study of chemical science as applied to war.

Application of chemicals to the principles of war is defined as the manufacture and use of gas in offensive and defensive measures for the purpose of gaining the objective or in carrying out the mission. Previous to 1915 records show evidences of smoke and liquid fire as the only forms of chemistry given war-time demonstration. During the World War armies of both sides employed chemical agents with such accurate results that their use in any future struggle is an established certainty. Whether or not gas can be made to apply to the Navy is still a conjecture, but the menace it offers to the man behind the gun is an item for serious thought.

Chemical agents are classified as vesicants, lung irritants, lachrymators, or toxic smokes

according to the effect they have on animals or beings. The application they have to naval problems can be summarized by the various possible ways of projection. Substantial methods of gas release are by bombs, torpedoes, cylinders fixed on decks of submarines, toxic smokes from stacks of fast vessels, and spray from tanks attached to racks on aircraft. Gas from submarines will be the lung irritant type released in a cloud from multiple groups of that class, which approach submerged or at night. Toxic smokes from fast moving vessels, such as destroyers and cruisers, will be loosed as a screen for the opposing ship to pass through. Gas from an aircraft will be of a vesicant type, sprayed from fast planes that approach under cover of clouds, or under cover of a screen made by other aircraft. Of these various methods, the two that show the easiest and most effective application are by submarine and by aëroplane.

Transitions in material and methods which follow mobilization are so rapid, as well as so radical, that if we expect to keep up with them, we must have our minds prepared in advance for deviation from the old standards. The ease with which chemicals lend themselves to fleet use, the added value of this form of weapon due to limitations placed on other types, and the short time required after the declaration of war for the procurement and preparation of all forms of gas projection, as compared to guns and ships, make these agents so important a point in the tactical offensive, that any advantage that might be gained by their use cannot be overlooked. It is difficult, in looking back, to understand the ignorance of professional soldiers along the lines of chemical warfare, but it is far more difficult to find excuse for such lack of knowledge now. It is true that no navy has definite record of being yet confronted with the problem of protection during an engagement against chemicals. It is worth-while to remember, nevertheless, that had the German Army commenced their attack with chlorpicrin, instead of with chlorine, it is quite probable that methods of defense could not have been perfected against it in time to have prevented defeat. Without over-stressing the embracing factors mentioned above, but still considering thoroughly the importance that chemical agents might have in fleet movements and coast landings, we must lay emphasis on the need for gas protection. We must foresee steps on the part of an opposing navy to bring chemical methods to bear effectively against us and be able to definitely meet them. We must announce a policy so that the training of our Navy in chemical warfare will be such as to oppose effectively any enemy employing the use of gas. This becomes a mission of major consideration.

A mission of this class should fundamentally include preparations both for offensive and defensive methods of attack with chemical agents. Ordinarily defense is overlapped by a strong offense. This mission can not be so outlined, because the U. S. Navy, with its complex systems governed by public opinion, Congress, and a spirit of agreement, has defined its objective in gas warfare as purely defensive. By this decision we are limited to consideration of only protective methods. Attempt will be made here to set out primary steps for the training of ships' crews in an organization of cover.

Protection must be considered in two phases—individual, and collective. Under the first phase are grouped all methods of gas control that pertain strictly to the individual. This includes such items as the gas mask, canisters, impervious clothing treated to deny liquid gas entrance, impregnated clothing treated to neutralize the injurious effect of gas vapor, hygienic methods in an infected area, and first aid. In the second phase are grouped methods of control that pertain to an assembly. This includes such items as gas proof rest compartments, spaces where gas entrance is absolutely denied, areas where the air is filtered through canisters, and gas riddance on a large scale.

The greatest danger at the beginning of another war, wherein gas is used, will come from panic which may follow if information is not diligently spread, and preparations made for protection. Each person on the ship must be given comprehensive instruction in its details. Teachings so outlined should be simple in form, progressive, and inscribe learning by doing. Methods should be simple and brief, but effective. To bring the ship's crew into manageable component groups, it is proposed to first establish a school for division officers, where they can be given a thorough understanding in the detailed parts of protection by mask, canister,

clothing, gas-proof spaces, filtered ventilation, and contamination removal. When this understanding is complete, these officers are to be used as a nucleus instruction body for the organization.

Due to the number of men in the crew of a ship, the problem of schooling this organization seems to be best met by grouping it into divisions, with the division officer responsible for proper instruction. The curriculum of the school should contain details of the gas mask, its use, types of masks, mask limitations, storage, repair, types, and use of protective clothing, ways and means of gas protection, and gas removal. The aim of all this is familiarization with proper care, fitting, and use of protective methods. At the same time, this will result in giving the officers and men some experience in the effect on their work, comfort, and endurance while performing their duties masked, or while confined to spaces where ventilation is controlled.

We find much opposition to the setting aside of sufficient funds for the manufacture of training appliances. The policy for this opposition comes from a group in control whose hands are effectively tied by public opinion, and this in turn is founded on the extreme shortsightedness of the layman, who does not seem to realize that there is anything more important in this training than the ability to put on and take off a gas mask quickly. The result is an almost complete lack of knowledge of the gas mask which should be issued today to ships in case of an emergency, and of the effect of gas mechanisms on the tactical handling of these crews.

Confined, as the problem seems to be, between such limits as the number of gas masks available, amount of chemical material at hand, useful number of trained personnel, and large displacement of instruction volume, training cannot conveniently be carried out during a gunnery year. For this reason, it is desirable to devote at least an hour a day to this schedule during the period that the ship is undergoing overhaul at her home yard. On first glance, this appears almost impossible because of the amount of ship work to be done. However, considering gas importance, the absolute lack of training of any sort in this subject, the convenience of a gas chamber, the number of drill masks available, and the inability to drill the whole crew on any other occasion, the necessity would seem to justify the time expended.

When the school of the individual is once completed, those charged with the preparation of training directives, training principles, and training regulations of the ship must include chemical warfare in their scheme. The organization of the ship should be written to include phases of protection under all conditions. It would be ridiculous to assert that in the next war, ships will be attacked only during actual engagement. They must be trained for protection from chemicals at all times. The organization of the ship should divide the crew into gas groups for both cruising and battle. Provision should be made for lockers with availability such that the divisions could, with the least possible conflict, equip each man with a mask. The limit of time allowance for this activity in issuing masks must be acknowledged when we weigh the possibilities that might result from a surprise attack and when we think of the demand for ready supply on call to general quarters.

To places where personnel function during an engagement, the ventilation system should furnish air filtered through canisters. Spaces where the wearing of gas masks would hinder the operations during battle should be gas tight, and a system of air purification built in. Sick bays, messing compartments, washrooms, and berthing areas should be made up gas proof to provide for continued ship operations during intervals that the existing gas condition proves menacing. Cruising routine must include sentries for warning, and a detail for closing such parts of the ship as it is intended to deny gas entrance. The organization should also provide for the preparation of these same spaces at the times when water-tight doors is sounded—this to prevent any unnecessary delay on surprise or night alarm.

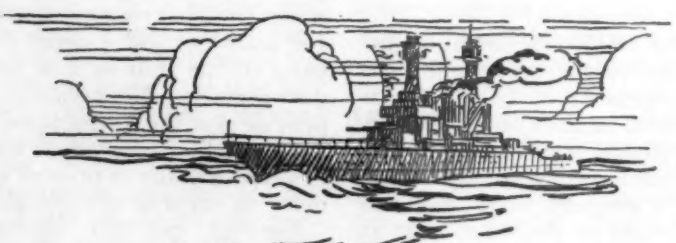
General quarters routine should be slightly easier to make provision for than cruising routine. Assuming that the men are already equipped with a mask, and that compartments are already closed, the sentries needed for sounding the gas alarm could very well be the battle lookouts.

Experiments with chemicals show that areas that have been thoroughly contami-

nated remain in that condition for a considerable length of time or until they have been completely de-gassed. Gas riddance, depending on the type used and the concentration employed, is a tedious process. Methods for accomplishing this vary in degree of simplicity from a mere matter of airing out the space, to giving the entire surface several coats of a cleansing wash with neutralizing solutions. Men engaged in this work must be carefully protected by approved types of gas-proof clothing. It is safe to believe that a well directed attack with chemicals would result in uninhabitable quarters and contaminated topside surfaces for several hours. Preparedness for ridding the ship of the effect of such an attack would make it mandatory to detail clean-up squads for all periods. Assuming that, as in all other emergencies, general quarters is sounded, clean-up squads would take station. With gas appliances normally falling under the cognizance of the construction and repair department, it is but natural to detail the clean-up crew to the forward and after repair parties. These men could then function under the first lieutenant's charge with no overlapping in responsibility. Definite measures for issue, care, and maintenance of equipage would be the result.

With the crew well schooled in individual protection, the clean-up squads could commence to operate toward collective protection. They could quite easily be schooled, and drilled in the work of protecting compartments and de-gassing spaces during the daily general quarters period. This interval is chosen as most appropriate, because at this time these men are released from ship's work and are not used for gun replacements. By spending one hour each week of this time on processes, and another hour each week on demonstrations, the practice of gas riddance could be mastered.

In general, in the formulation of these plans, it should be kept in mind that chemical warfare means and methods, both as measures for individuals and for collective protection, are but aids in the accomplishment of the tactical mission. The exercise should be so drawn as to cause the crew to apply sound principles in the carrying out of the mission which will be normal in war, and which would logically involve the use of chemical means and methods in an auxiliary rôle. To this end, care should be taken against unduly emphasizing chemical features to the extent of making them illogical. Protection against chemicals should simply be considered as part of the equipment.



DUTY BEYOND THE SEAS

By Constance Lathrop

ON THE white silent wastes of the Arctic, on the palm-fringed shores of the tropics, in a sunken garden in Italy, in a Buddhist temple grounds in Tokio, stand memorials to the dead of our Navy. These memorials are a vital part of our naval history, sometimes the only record of the achievement or act of heroism they commemorate.

The service these gallant dead perform is an enduring one. Through all times and in all parts of the globe they uphold the highest traditions of the Navy. To them has fallen the task of laying down their lives under alien skies as a simple act of duty. They are a bond of sympathetic interest between other countries and our own. Not infrequently other nations and peoples have erected the memorials.

A visitor to the Honmonji Temple, Tokio, will see due east of the Soshido, framed in a lovely green bamboo setting, a granite monument bearing, in part, this inscription:

> In Memory of Some of the Unknown Dead of the U.S.S. *Oneida* Lost in Yedo Bay, January 24, 1870, Whose Remains Were Here Interred by Charitable and Tender Japanese Hands May 4, 1889.

The Japanese have so commemorated, in these beautiful temple grounds, the death of some of the heroic crew of the U.S.S. *Oneida* who perished trying to save their ship, and whose remains were found many years after the disaster. At dusk on January 24, 1870, the *Oneida* proceeding down Yokohama Bay collided with and was literally cut in two by the merchant ship *Bombay*, which proceeded on its way. The *Oneida* sank in fifteen minutes with a loss of one hundred and fifteen officers and men, who stood by in an effort to beach their ship.

In the foreign cemetery at Yokohama stands another monument to the *Oneida's* dead, erected by the personnel of the Asiatic Fleet at that time. It is a large pyramidal monument on the four sides of which are cut the names of the officers lost, and the number of the crew. Whenever one of our naval vessels is in port on Memorial Day appropriate ceremonies are held before the *Oneida* monument.

One of our naval attachés recently found on a trip to the Luchu Islands some graves of American seamen buried there at the time of Commodore Perry's expedition to Japan in 1854, when that country's ports were opened to the commerce of the world.

Historic indeed is the resting place of five officers of the American Navy in the beautiful garden of Landolini, Syracuse. The garden was originally a stone quarry called Latomia dei Cappuccini. From its depths was extracted the stone used in making the walls and temples of the great Greek city of Syracuse. In later times this immense pit was used as a prison, housing in 415 B.C. nine thousand Athenians, placed there to suffer captivity.

At the present time Latomia dei Cappuccini is a garden of great beauty. Within its gates are groves of lemons, almonds, olives, oranges, pomegranates, and wild figs. Outlined against the blue sky are tall slender cypress. Flowers of all hues blossom in great profusion and the white walls are festooned with pink geraniums and ivy. Below, scooped out in the walls are halls and niches made during the Roman period to hold tombs for the nobles. Here in a tomb sunk into the wall lies William R. Nicholson, midshipman of the Navy, who was buried there in 1804.

In the garden, in a fair state of preservation, are the graves of James S. De Blois, purser of the U.S.S. *Constitution* in 1803; of William Tyler, Assistant Surgeon from Prince George County, Maryland, who died at Syracuse in 1832; Lieutenant Joseph Maxwell, late commander of the U.S. *Gunboat Number 3;* and Lieutenant Seth Cartee, late commander of the U.S. *Gunboat Number 10.* Their presence in this ancient spot must awaken within the traveler who passes, a feeling of national consciousness.

San Juan del Norte, Nicaragua, contains

a plot of ground, about fifty feet square, inclosed by an iron fence with a gate at the entrance on which appears the wording: "Erected by the officers and crew of the U.S.S. *Sabine*, 1860." Within the enclosure are distinguished six headstones which are inscribed with that simple but fine tribute, "Erected by his Shipmates."

In remote Samoa, the British and Americans have together erected a memorial to the brave men of their respective navies who fought and fell in a common cause on the tropical shores of that island in 1899.

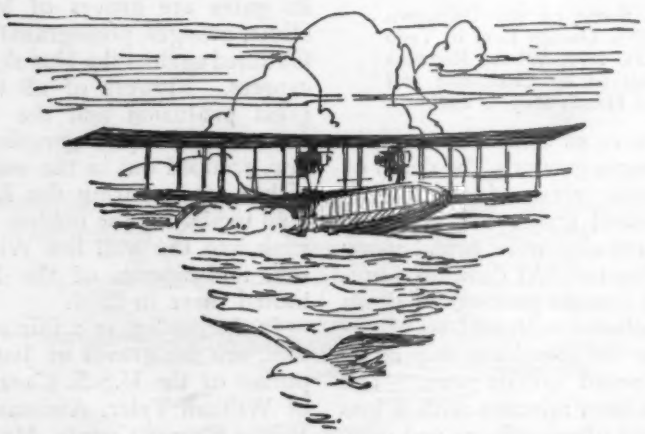
For many years on a cairn in the Arctic there stood a memorial carved in wood which bore the legend "In memory of H. H. Erichsen, October 6th, 1881, U.S.S. *Jeannette*."

Matthew Fontaine Maury once so aptly said: "Navies are not all for war, peace has its conquests, science its glories; and no Navy can boast of brighter chaplets than those which have gathered in the fields of geographical exploration and physical research."

During the eighties our Navy gathered many of the laurels so finely described by Maury. The *Jeannette* expedition in search of the North Pole was one of them, and the service of the men who did not return from that expedition will ever live through time.

As recently as September 20, 1930, in Newcastle-on-Tyne, England, there was unveiled with impressive ceremony a memorial to Captain George Bell of the U.S.S. *Santee* and Private Philip Leger. A British newspaper in commenting on the event said that another link in England's chain of friendship with the United States was forged by this gracious tribute to an American war veteran.

So are the milestones of our naval history marked by the deeds of these silent sentinels who are still performing duty beyond the seas.



Courtesy the late Captain R. D. Hasbrouck, U. S. Navy

TOMB OF PURSER DE BLOIS OF THE U.S.S. *CONSTITUTION*
This tomb stands in the lovely grounds of Villa Landolini, Syracuse, Sicily.

Courtesy Office of Naval Intelligence, Navy Department

IN ST. ANDREWS CHURCHYARD, PLYMOUTH, ENGLAND

The grave of Commander William Allen, U. S. Navy, Captain of the brig *Argus*. He was killed in action with H.M.S. *Pelican* in 1813.

Courtesy Office of Naval Intelligence, Navy Department

IN ST. ANDREWS CHURCHYARD, PLYMOUTH, ENGLAND

The grave of Commander William Allen, U. S. Navy, Captain of the brig *Argus*. He was killed in action with H.M.S. *Pelican* in 1813.

Courtesy Constance Lathrop

MONUMENT ERECTED TO THE UNKNOWN DEAD OF THE U.S.S. *ONEIDA*, IN THE HONMONJI TEMPLE GROUNDS, TOKIO, JAPAN

Courtesy Constance Lathrop *Photograph by Lieutenant Commander J. M. Creighton, U. S. Navy*

SOME OF THE MEMBERS OF COMMODORE PERRY'S EXPEDITION TO JAPAN ARE BURIED ON THE LUCHU ISLANDS

Courtesy Constance Lathrop *Photograph by Lieutenant Commander J. M. Creighton, U. S. Navy*

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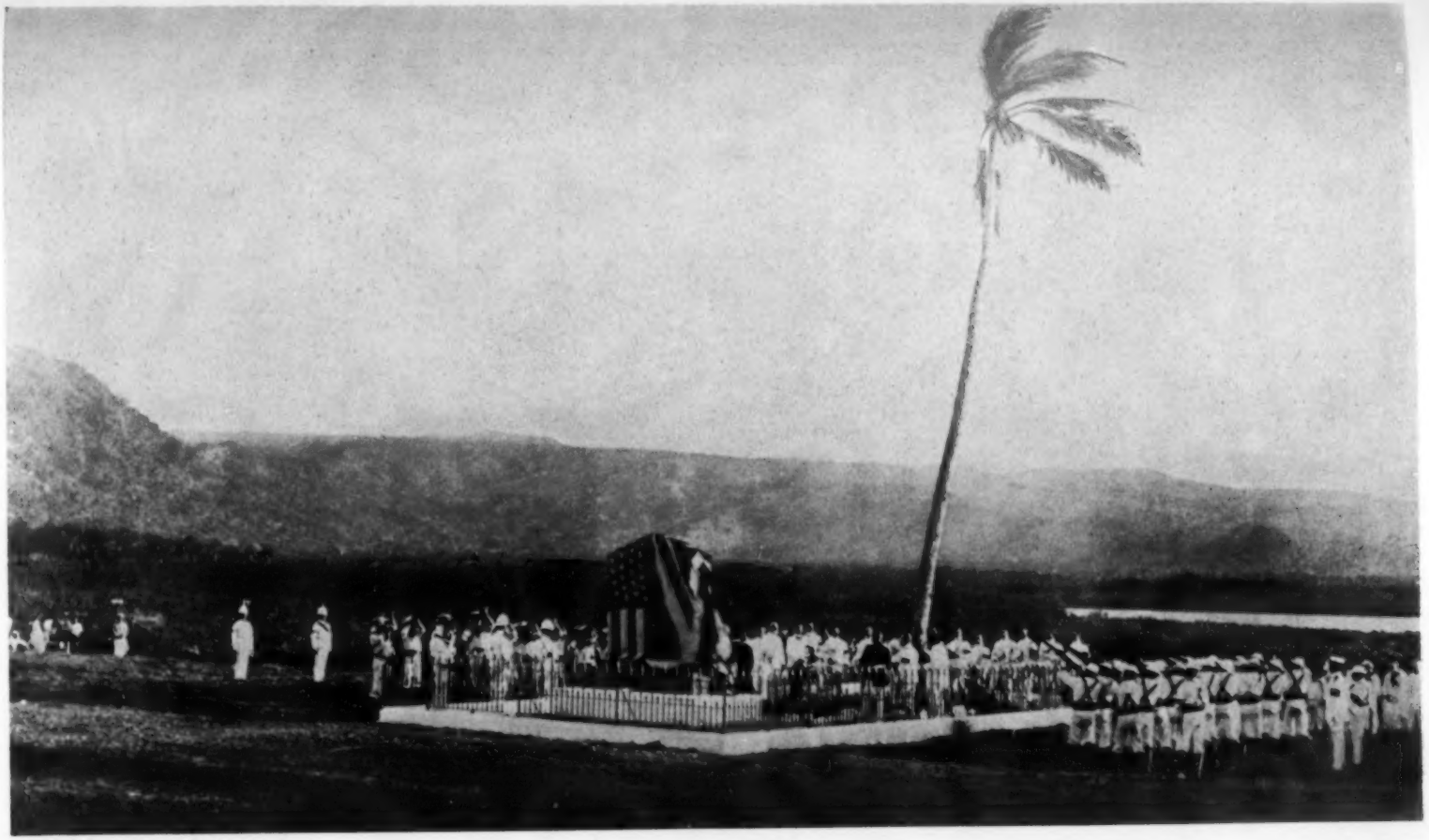
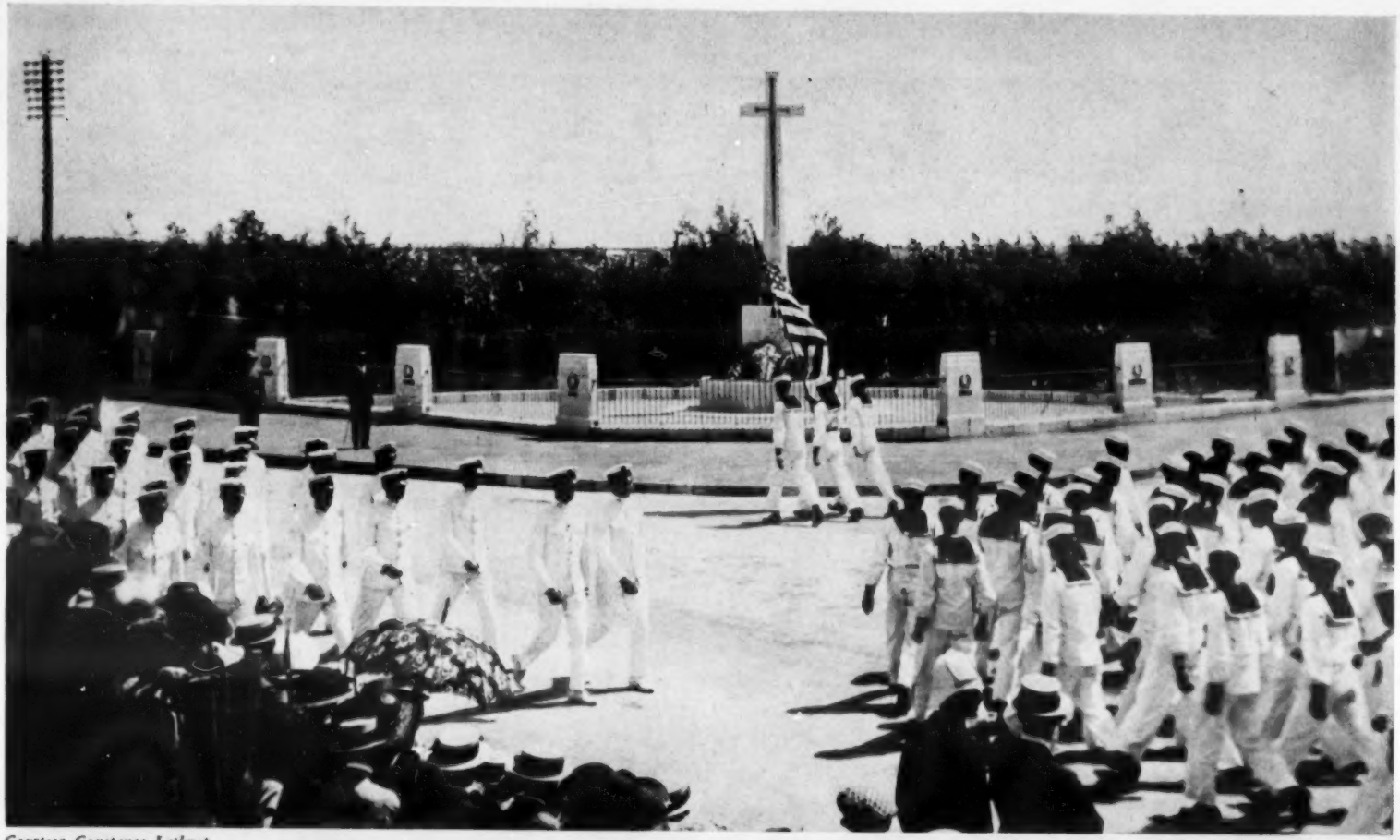


Courtesy Constance Lathrop

UNVEILING OF MEMORIAL ERECTED BY ENGLAND AND AMERICA IN MEMORY OF THE SAILORS OF THEIR NATIONS WHO FOUGHT AND FELL TOGETHER IN THE SAMOAN CAMPAIGN OF 1899



Courtesy Constance Lathrop

UNVEILING CEREMONIES OF MEMORIAL ERECTED AT GIBRALTAR TO TWENTY-ONE OFFICERS AND MEN OF U.S.S. *CHAUNCEY* WHO LOST THEIR LIVES IN THE WORLD WAR

The photograph shows midshipmen and bluejackets marching to the ceremony.

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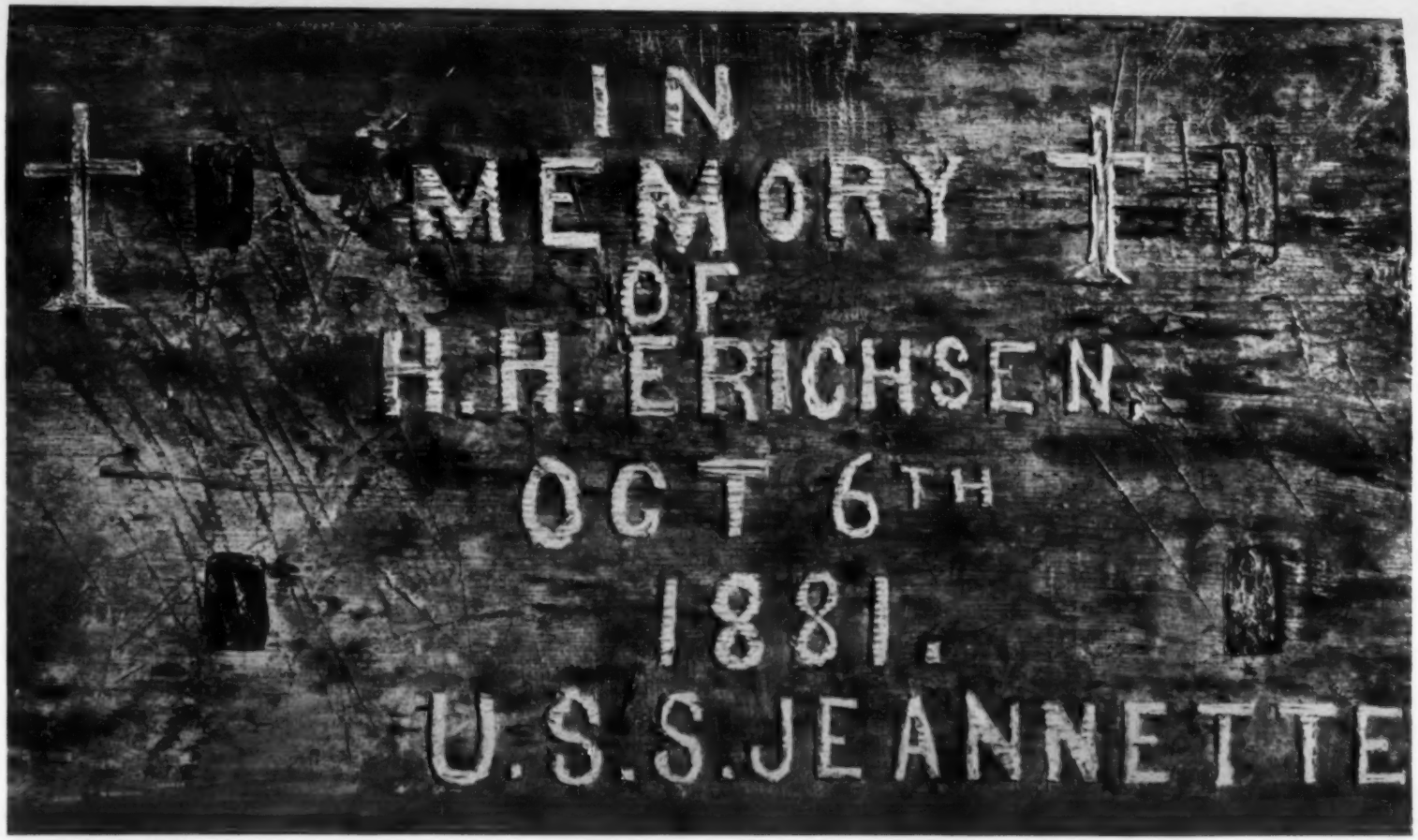


Courtesy Constance Lathrop

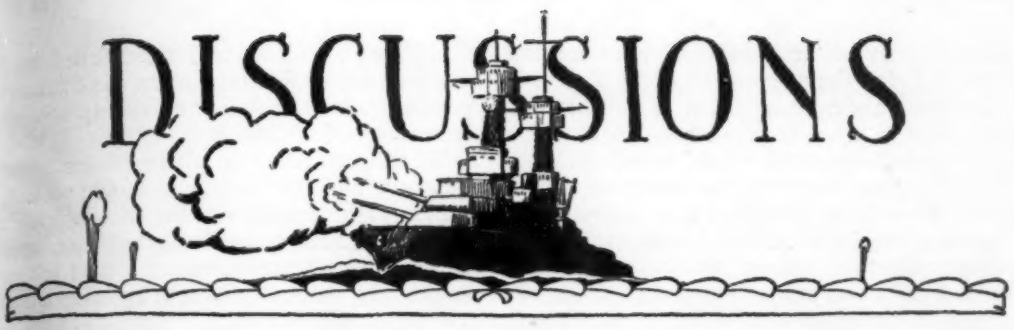
A REMINDER OF THE DELONG ARCTIC EXPEDITION

The *Jeannette* was crushed in the ice on June 12, 1881, and Seaman Erichsen died of starvation, nearly four months later.

Courtesy Constance Lathrop

MONUMENT ERECTED IN 1866 AT CHERBOURG, FRANCE, BY THE OFFICERS AND CREW OF THE U. S. STEAMER *FROLIC* TO THEIR SHIPMATES WHO DIED THERE DURING A CHOLERA EPIDEMIC

DISCUSSIONS



A Practical Application of Navigation to Aircraft

(See page 392, March, 1931, PROCEEDINGS)

BY LIEUTENANT (J. G.) H. P. MCLEAN CONNOR, U. S. Naval Reserve.—With reference to the New York-Bermuda and return nonstop flight and answering Lieutenant Commander Fairland's questions in order:

(a) The drift was determined constantly throughout the voyage (with the exception of the short night period) by the seaman's eye, i.e., judging the direction and velocity of the wind at the surface from the state of the sea and thereby making due allowance for drift by the solution of a simple problem in trigonometry. (NOTE: The air speed meter and tachometer had been carefully checked prior to the flight and were accurate. Lieutenant Commander Fairlamb will also note from the navigation log the low altitude which was maintained.)

The only other check on the drift was by "sighting" on the vessels in the New York-Bermuda track as we left them astern. (NOTE: The drift "sights" obtained on the steamers checked to the degree with the method described above.)

(b) I believe I stated in my article that we carried three magnetic compasses but neglected to state which one was used to steer by. All three were Pioneer compasses. The earth inductor compass dial was used to steer by and worked perfectly for the entire flight thereby enabling the pilots to steer the course to a degree. The other two compasses were of the standard aircraft magnetic card type, (liquid) Pioneer type 56, graduated to every fifth degree. These were used only as stand-by compasses and for checking purposes, the deviation on each compass being known. We did not carry an aperiodic compass.

(c) I believe the plotting sheet reproduced on page 1065, December, 1930, PROCEEDINGS shows five single sun lines. This chart is marked "as used by the navigator" and is only intended as an example of the chart actually used for the purposes of publication, and does not contain all the sun lines taken on the flight, the others being omitted for the sake of clarity, and so that the chart might be easily understood by the layman.

Actually each single line plotted was the resultant mean of four "sights" taken at intervals within a minute of time for each "sight."

The term "position by observation" as marked on the plotting sheet is technically incorrect, as the sun lines of position were crossed by dead-reckoning latitude and assumed as "best" positions.

The writer stated in his article that the observations of the sun were calculated by line of position methods and used in conjunction with dead-reckoning navigation.

The octant used was a Willson-type octant with a bubble attachment. This instrument is a right-handed octant and the observations are made similar to those with an ordinary nautical sextant.

After long practice at sea and in the air, I found it convenient to use. My average error for sun observations is from one to three miles under favorable conditions. Some time prior to the Bermuda flight I conferred with Lieutenant Commander Weems, and after comparing notes he concurred in the opinion that it was more advantageous to stick to the instrument I was most familiar with than attempt to change to a different type of bubble octant. This also applied to navigational methods.

It is logical that only after considerable experience, can a navigator have the complete confidence necessary in order to be able to rely on his positions whether by dead reckoning or observation.

Shortly after obtaining an unlimited mas-

ter mariner's license in 1925 I became interested, for the purpose of ocean flying, in applying nautical navigation to aircraft in a practical way. A few short flights in which I struggled along with a bubble sextant without any great degree of accuracy soon convinced me that a good deal of practice would be necessary before I could reduce my errors to a minimum.

In 1927 I was anxious to make a Bermuda flight in order to establish a reputation as an aërial navigator. With this thought in mind I made a number of extended over-water flights ranging from 150 to 350 miles off shore, intercepting vessels whose position, true course, and average speed I had obtained by radio prior to taking off. After constant practice at frequent intervals I was finally able to reduce my error in determining drift by the seamen's eye from 8 per cent to practically zero.

These interception flights were made on straight-away and triangular courses under nearly all weather conditions, with the exception of fog, with winds ranging from force zero to seven (Beaufort scale). Captain Davis and Captain Francis, commanders of the M.S. *Bermuda* and SS. *Fort Victoria,* respectively, will doubtless recall that on more than one occasion we intercepted their vessels approximately halfway to Bermuda and according to estimated time after encountering variable winds.

While serving on the 32,000-ton turbo electric liner *California* during 1928-29 in the Panama-Pacific run, I had ample opportunity to become experienced in the use of the bubble octant, supplemented by the above mentioned practice flights while in port. Referring to my workbook I find an average of five sets of astronomical observations taken per day over 75 per cent of days at sea, i.e., morning stellar, 8:00 A.M. sun, noon position (observations of the planet Venus, when visible), 4:00 P.M. sun, and evening stellar observations.

Referring to the Bermuda flight; taking the 10:39 A.M. sun line for example. This was the result of four "sights" taken at 10:37, 10:38, 10:39, and 10:40, respectively. In this case each sight was worked out separately. I disregarded the 10:37 and 10:40 lines and used the 10:38 and 10:39 sun lines as they worked out within a mile of each other, crossing the sun line with my D.R. latitude run up from my last known position, i.e., time of passing the SS. *Fort St. George.* (You will note that I have marked the 10:39 sun line on the chart and gave the 10:38 sight for an example as calculated by *H.O. 208.*)

Two hours prior to taking off from New York we had received by radio the position, course, and speed of the SS. *Fort St. George,* and as we had intercepted her within a minute of our estimated time I felt we could rely on that position as being within a mile or so.

Obviously, this case would not always apply as only practical experience could guide the navigator in his judgment of assuming his "best" position or "fix," and no hard and fast rules should be laid down.

On the recent Atlantic flight of the *Columbia,* in which I participated, we flew approximately 1,400 miles without obtaining observations. Part of this was "blind" flying and during the remainder of the night, when we were finally above the cloud level, the ship was tossed around in the rough air due to the winds of gale force rendering the bubble octant useless for that period. As there was no way we could check our drift during the night period I naturally had to estimate it by approximation. For almost two and one-half hours after sunrise, observations were useless due to the existing refraction; here again only practical experience could tell the navigator whether or not he could rely on his sights under such conditions. (I did not attempt to take observations during this period.) When I finally obtained a "fix" about 0940 G.C.T., October 10, after the sun's bearing had changed sufficiently to give a fair angle, we were approximately 130 miles SSW., of our D.R. position, and the course was altered towards Land's End, England, and Croydon, London. (NOTE: We had been allowing 40 degrees for drift during the latter part of the night; this was evidently insufficient.)

In this instance I obtained my "fix" by crossing the first sun line with the second, making due allowance for the true course and run between. (We were then maintaining a relatively low altitude and checking drift by my old reliable method.) I continued to obtain sun lines and "fixes" by crossing them until we finally made landfall slightly on our port hand, in clear weather, at 0340 G.C.T. This was the Scilly Islands.

Upon arrival in London the following day it was interesting to note in a London newspaper that the British steamer *Virigilia* had

reported sighting us some 200 miles off Land's End. They reported our position in latitude 49.08 north, longitude 10.25 west at 14.00 G.C.T., October 10. Upon checking back our own position on the chart for that time it was interesting to note that the difference between the steamer's calculated position and our own was six miles. (This difference divided by the numbered of miles we had flown gives a very small percentage of error.) With reference to the method of checking drift I most decidedly would not recommend this method for inexperienced navigators, and I go as far as to say it would only be safe in the hands of experienced navigators. It was also my theory that it was necessary for an aërial navigator to obtain his training and background in practical experience as a navigating officer at sea before attempting difficult long overwater flights, and after my own experiences I am still of the same opinion. I believe it quite possible that experienced ocean navigators, after 100 hours flight training in actually navigating aircraft over water, would be able to cope with any problem which might confront them.

To attain accuracy the whole situation summed up is that "practice does make perfect."

I agree with Lieutenant Commander Fairlamb that the value of such flights adds little to that already accomplished other than for personal gain or ambitions. But the military value in the proof that such flights can be made without radio, as might be necessary in time of war, and still retain the ability to make perfect landfalls, is not to be ignored.

For instance, flight, without the aid of radio, from the Pacific coast to the Hawaiian Islands, thence to Gaum and the Philippine Islands, connecting up the naval bases, would be of tremendous importance to national defense in time of war.

I welcomed the low visibility and rain which was encountered within 100 miles of Bermuda, as it gave no opportunities for skeptics to believe that the island could have been seen had we been a few miles off our course.

Lieutenant Commander Fairlamb shows an expert knowledge of aërial navigation from the way in which he discusses the problems that confront navigators on difficult over-water flights, and I hope that the above comments may clarify some of the points he discussed.

Elements Contributing to Aërial Superiority

(See page 437, April, 1931, PROCEEDINGS)

By COMMANDER R. K. TURNER, U. S. Navy.—The award of the annual Naval Institute prize to an essay concerned with the importance and effectiveness of aircraft in warfare at sea is stimulating evidence of the position held by aviation in the American Navy. The author's contention that vigorous defensive measures are necessary to permit the fleet to continue effective operations within its usual sphere will find ready response among the many officers who are familiar through daily routine with present conditions, so greatly changed in a decade.

We may agree with the central theme of the essay that it is desirable to evolve an efficient gun defense against bombing aircraft, since it is particularly in the case of first attacks that our defense in the air will be least effective. Time and altitude factors may easily permit enemy formations to deliver their first blows before being broken up by our fighter patrols. However, though the activities of such patrols cannot prevent initial thrusts, a vigorous air defensive will diminish the power of successive attacks, and therefore must not be neglected in prolonged and general sea actions. Perhaps the author emphasizes too strongly the importance of antiaircraft gunfire, as he fails to mention the most effective measure for diminishing the accuracy of aircraft bombing. This is a heavy smoke cloud, which, laid by the leading destroyers of a group steaming into the wind will hide the larger vessels from eyes in the air and thus gain valuable time for active work by our own fighting planes.

The essay gives in detail a program that may seem ambitious to those naval officers who have had to cope with the problem of obtaining the "enormous resources of the Navy Department" from governmental dispensers of revenue. They will scarcely accept as negligible their success in obtaining many millions for the installation of deck protection and great numbers of new antiaircraft guns and control apparatus. Moreover, it would seem that not much more can be accomplished to improve the antiaircraft gun defense of the fleet for many years in view of the following prohibition in Part 3, Sec. 1 (d), of the Washington treaty:

"No alterations in side armor, in caliber, number, or *general type of mounting* of main arma-

ment shall be permitted—" (in retained capital ships and aircraft carriers).

But there is one idea expressed in the essay that calls for vigorous disagreement, and especially so because this idea is the natural reaction of officers who have not carefully studied the problem. I refer to the discussion of the flying-deck cruiser, inaptly called the "hybrid" cruiser. Others have misnamed it "hermaphrodite." So once was termed "a cheese box on a raft," the immortal monitor!

As the author suggests, it is entirely feasible to convert large, fast merchant vessels for use as aircraft carriers. But since their material preparation in peace would contravene Art. XIV of the Washington treaty, many months after the outbreak of war must be consumed in conversion and training before they are fit for service. Therefore the proposal to employ a merchant vessel carrier and a small cruiser in company instead of their equivalent, one flying-deck cruiser, can scarcely be accomplished during the first year after the outbreak of hostilities.

Before discussing the wide field of usefulness of flying-deck cruisers, we should first realize their cost in treaty cruiser tonnage:

(1) Under the London treaty, a maximum of 83,000 tons (say 80,000) may have flying decks.

(2) This will build eight 10,000-ton flying deck cruisers, each carrying about nine 6-inch guns and twenty-four planes.

(3) None of these 80,000 tons can be used in 8-inch cruisers.

(4) A 10,000-ton 6-inch cruiser will mount twelve guns and carry four planes. (Many officers would prefer eleven cruisers carrying nine 6-inch guns and two planes each; such construction, however, would not change the essentials of this comparison.)

(5) Therefore by building eight flying deck cruisers instead of eight 6-inch cruisers:

We lose: twenty-four 6-inch guns.

We gain: one hundred sixty airplanes in the fleet (more than carried by the *Lexington* and *Saratoga*). Eight mobile landing fields.

In condemning the flying-deck cruiser the author quoted Mahan's words:

> In the design of the individual ship of war—exclusiveness of *purpose*—is the secret of great military success.

The italics are mine. It is in considering the *purpose* of cruisers that many of us are led astray.

Because the cruiser mounts guns, many assume her purpose is fighting. It is true that every naval vessel should be as well armed as possible, since severe opposition may be encountered in accomplishing a mission, and in this respect a flying-deck cruiser with nine 6-inch guns and twenty-four planes, half of which carry heavy bombs, will, I believe, be the superior of even an 8-inch cruiser. Fighting ability is of great importance in cruisers, but their actual *purposes* are the following:

Escort for convoys
Long-range search for raiders
Trade destruction
Blockade patrol
Raiding
Long-range scouting
Fleet tactical scouting
Distant screening
Close screening
Support and denial of destroyer attack.

Fighting is always a *possible* result of any of these cruiser operations, but only a *probable* result of the last two. The *purpose* is one of the above missions; fighting is incidental to its accomplishment. The steady pressure of the fleet may continue for years with only minor actions; on every day of those years cruiser work is important. Does any reader know of an important naval general action decided as a result of the fighting ability of cruisers? Can any reader visualize an important naval war where subsidiary cruiser activities are not essential to the final winning dispositions of the victorious fleet?

For most of these purposes the flying-deck cruiser's planes will make her far superior to ordinary cruisers, and under nearly all weather conditions give her greater fighting ability.

The flying-deck cruiser is the ideal escort for convoys. Her scouting planes can insure a route being chosen each day that will be clear of casual enemies, while her bombers can engage successfully any hostile surface or submarine vessel except a carrier or similar cruiser and at a distance that will keep the convoy safe.

In an ocean-wide search for enemy raiders, in a patrol to blockade hostile ports, and in operations against enemy trade routes a flying-deck cruiser's planes will not only

extend the radius of vision from fifteen miles to two hundred miles but themselves can halt a suspicious vessel and conduct it to their floating base. While for raids on convoys, advance bases, submarine patrols, and scouting lines nothing could be better except an aircraft carrier, of which we may have such a precious few.

The great advantages possessed by a flying-deck cruiser for distant and tactical scouting are disproportionate to her number of planes, because these can operate over any sea, however rough, while the planes of an ordinary cruiser cannot be launched except when the sea is smooth enough for landing. And yet her landing deck will actually increase the usefulness of other cruisers, whose planes can there find haven in stormy weather. On the other hand, her bombers can attack the vessels of a protective screen, and so allow our cruiser to penetrate areas usually closed to light craft. Attached to a distant screen her fighting power will permit her to displace even battle cruisers, and in a close screen she is at least as good defensively as any 6-inch cruiser.

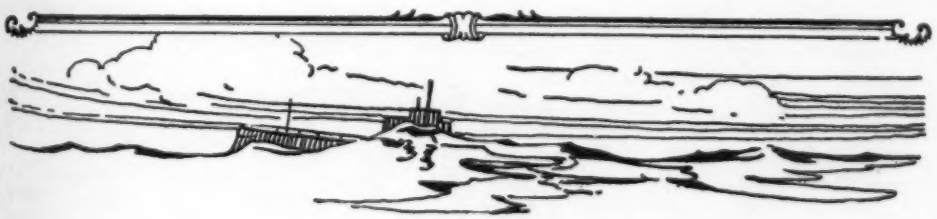
In low visibility when surprised with planes on deck, the flying-deck cruiser still will have all the power of her nine 6-inch guns; vulnerability from gasoline fires is not so great as is generally supposed and projected improvements in fire fighting apparatus will remove present objections. But gun defense would only be a last resort, even in assisting or resisting destroyers, because the bombing and strafing abilities of her twenty-four planes are especially effective against unarmored vessels.

In rendering two services a flying-deck cruiser will be the equivalent of a small carrier: attack with heavy bombs on capital ships, and providing an additional emergency and servicing landing deck for the airplanes of the battleships, cruisers, and carriers.

At first sight, this new type appears fantastic. However, after continued study and a stern repression of preconceived notions one is convinced here is a vessel that may well be revolutionary in its effect on sea warfare.

But we must admit the sad truth of the Mahan excerpt chosen as the motto of the prize essay. The seaman not only observes that changes in tactics are unduly prolonged after the introduction of changed weapons, but the unfortunate fellow himself resists the change through persistent conservatism!

The changed weapon is the airplane; where are the changed tactics?



PROFESSIONAL NOTES

March 2 to April 1, 1931

Commander D. B. Beary, U. S. Navy
Lieutenant Commander D. C. Ramsey, U. S. Navy
and
Professor Henry Bluestone, U. S. Naval Academy

United States
Heavy-Oil Engines in the Navy 677
Airship's Value Defended 677

Great Britain
The *Blanche* 678
The Modernizing of Naval Vessels 679
Imperial Defense College 679
Guns in Submarines 680

France
The *Jeanne d'Arc* 680
The *Pluton* 680

Italy
Destroyer Trial Speeds 680
Keel of New Cruiser Laid at Leghorn 681
Miscellaneous 681

Germany
The *Ersatz Preussen* 681

Merchant Marine
California Nautical School 682
American Shipyards Busiest Since War Days 682
The Course in Ship Operation at M.I.T. 683

Engineering
Marine Boiler Development Since the War 684
Largest Mercury-Vapor Turbine To Be Erected 687
Experts View Test of Gyro-Stabilizer 688

Aviation
Organization of French Naval Aviation 689
The Army and the Royal Air Force 690
A Remedy for Ice Formation on Aircraft 692
Catapult Launching for Airplanes 692

Miscellaneous
All-Weather Sextant 695

UNITED STATES

Heavy-Oil Engines in the Navy

Engineering, February 20.—Considerable discussion has been caused in America by a clause in the Naval Construction Authorization Bill, under which the Secretary of the Navy is empowered to spend £100,000 on the purchase of experimental heavy-oil engines in Europe for American war vessels. Reports have been published in America to the effect that in the opinion of certain naval officials, and of some members of the Naval Affairs Committee of the House of Representatives, the American heavy-oil industry has not kept pace with the European industry, and that American builders are not equipped to supply engines that will meet the Navy's requirements. These allegations have been vigorously denied. It is claimed that American heavy-oil engine builders are fully abreast of those in Europe, and that there is a complete system of coöperation between firms on both sides of the Atlantic as regards the interchange of technical knowledge, designs, inventions, and staff. In at least one respect, namely, in the matter of castings, American heavy-oil engine practice is claimed to be in advance of European practice. The leading firms in the industry, it is asserted, have operated successfully and profitably for the past twenty years or so in spite of the lack of orders for heavy-oil engines for use in the American Navy and mercantile marine. It is pointed out that whereas experiments made by the U. S. Navy itself to construct heavy-oil engines to foreign designs resulted in failure, the American submarines built during the war were fitted with engines produced in private plants, and that those engines proved satisfactory. Among the leading heavy-oil engine builders in America are the McIntosh and Seymour Corporation, a subsidiary of the American Locomotive Company; the Sun Shipbuilding and Dry Dock Company, licencees for the Doxford opposed-piston engine; the Cooper-Bessemer Corporation; and the Winton Engine Corporation; the Nordberg Manufacturing Company, holding the Fiat rights; Busch-Sulzer Brothers, Sulzer engines; the Bethlehem Shipbuilding Corporation; the Newport News Company; Werkspoor engines, the Hoover, Owens, Rentschler Company; M.A.N. engines, the Worthington Pump Corporation; and the New London Ship and Engine Company, M.A.N. engines. As in this country, American manufacturers seem to have relied, to a large extent, on foreign licenses.

Airship's Value Defended

Dirigible's Efficiency is Held to Have Been Proved

(See page 536, April, 1931, PROCEEDINGS)

New York *Times,* February 26, 1931.—Referring to the criticism of airships contained in the article in the New York *Times* of February 25, 1931, and headed "Naval Men Doubt Airship War Value," a few remarks seem pertinent at this time.

To judge the naval value of modern rigid airships by the recent solitary naval employment of the *Los Angeles* would seem rather hasty and premature. The statement that "experiences of the *Los Angeles,* in maneuvers strengthen the belief long held" seems evidence of a preconceived notion, and that in some instances the matter was prejudged before the maneuvers by persons with closed minds. There also seems to be great haste to condemn the airship and little haste to divulge what may have happened equally as theoretically to surface craft.

This criticism is particularly interesting in view of the following dispatches from the Assistant Secretary of the Navy for Aëronautics and Admiral Pratt, with which the expressed view in the *Times's* article radically differs:

(a) By Assistant Secretary Ingalls:

"I am exceedingly gratified at the marked success attendant upon the use of the *Los Angeles* in connection with the fleet maneuvers, although the ship was employed only in a scouting capacity, and therefore no defense of her at all was attempted.

"One experience has conclusively established that such type ships are of material value in naval operations at sea in defense of our coast. The repeated contacts with theoretically friendly ships and the final discovery of the main body of the theoretically hostile fleet attacking the Panama Canal definitely establish the advisability or, rather, the necessity of the continued development and maintenance of lighter-than-air by the United States Navy."

(b) By Admiral Pratt, chief of Naval Operations:

"Thus far the fleet problem being staged has revealed two outstanding points: First, the necessity for cruisers, and especially

those of the flying-deck type; and second, the justification under favorable conditions of the lighter-than-air craft as shown by the use of the *Los Angeles.*"

It should be pointed out that in these naval maneuvers, which involve practically every unit of the Navy, there was employed but one airship. From the late date at which the participation of the *Los Angeles* in the maneuvers was announced, it is believed that she was injected into the problem after it had been drawn up. It is assumed that the commander in chief assigned the area to be patrolled by the *Los Angeles.*

While it is undoubtedly true that airplanes did render excellent service in these maneuvers, it must be remembered that there was a preponderant number of airplanes present. No doubt there were many surface scouts also to one single airship assigned to one locality. It would be interesting to know how many of the scouting planes and surface scouts actually reported valuable information.

The views reported in the article would indicate that the value of negative information has been largely discounted. Anyone with a fundamental comprehension of naval matters should know that under certain conditions negative information can be of extreme importance.

It is immaterial that the *Los Angeles* was theoretically shot down. Undefended, slow, obsolete, such a thing would be expected on making tactical contact with combatant ships. It is quite another matter to attack an armed modern airship. A helium-filled ship is not necessarily destroyed by a few shots or even a few bombs. It would be interesting to have available the data or the deductions by which the *Los Angeles* was theoretically destroyed.

At the same time, it would be equally interesting to know how many surface craft were casualties under the same theoretical assumption.

The criticism as presented fails to take into consideration the use of the observation basket, the airship's own planes, the greater speed, the greater cruising radius, the greater areas that can be covered by new, modern airships. To judge the naval value of the rigid airship as a type by the performance of an obsolete craft engaged in a naval problem with only the latest types of other naval craft is giving the airship an unfair break. It would be like judging the performance of the battleship today by the old *Oregon,* for example.

It is not understood what difference it makes that the airship was seen by a destroyer or other enemy vessels. As long as the airship had already transmitted her information her loss might be a cheap price for the data supplied. However, the mere sighting of the airship by an enemy vessel means nothing.

A statement has been made by some one that the price of the *Los Angeles* would have been better spent in the building of destroyers or other types.

It is pointed out that it would be impossible to build a destroyer for the price of the *Los Angeles.* A modern destroyer would undoubtedly cost well over $4,000,000. The *ZRS-4,* being the first modern airship, will cost about that same price, but subsequent airships will cost materially less.

If destroyers or any other surface type could perform the functions of an airship more effectively, or even as well, it might be only sensible to build destroyers for that purpose with the money. However, they cannot perform airship functions.

The article in question fails entirely to realize that the airship under many conditions can perform functions very much more efficiently than any other existing type.

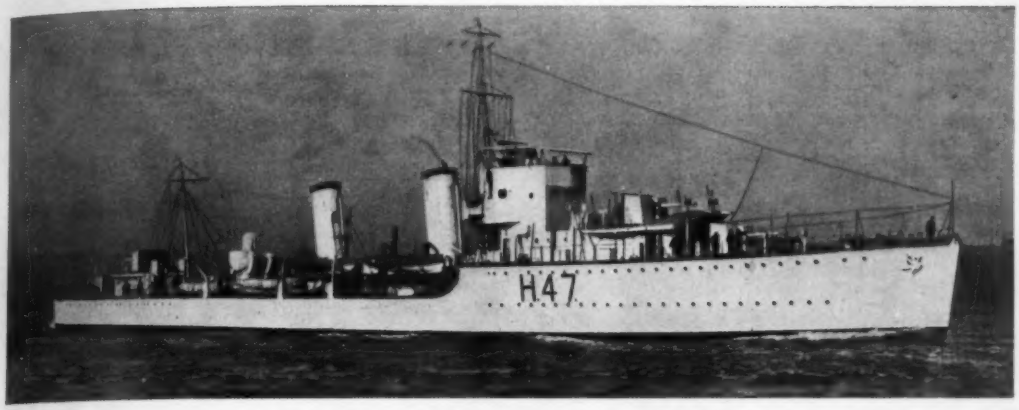
GREAT BRITAIN

The "Blanche"

Shipbuilder and Marine Engine Builder, March.—It will be recalled that Messrs. R. and W. Hawthorn, Leslie and Co., Ltd., were allotted a contract for the hulls and propelling machinery of two of the eight torpedo-boat destroyers ordered by the British Admiralty under the 1928 naval program. These vessels are named the *Blanche* and *Boadicea.*

The leading characteristics of the 1928 destroyers have already been published in this journal, but they may be repeated as follows:

Length	312 ft. 0 in.
Breadth	32 ft. 3 in.
Mean draught at standard displacement	8 ft. 6 in.
Standard displacement, tons	1,330
Designed s.hp. on full-power trial	34,000
Corresponding speed knots	35
Oil-fuel capacity, tons	380
Guns	Four 4.7-in.



H.M. TORPEDO-BOAT DESTROYER *BLANCHE*

The propelling machinery of the *Blanche*, constructed at the St. Peter's works of the shipbuilders, consists of two sets of single-reduction geared turbines, with three water-tube boilers arranged for a working pressure of 300 lbs. per sq. inch and 200 deg. of superheat under closed-stokehold conditions.

Laid down at Hebburn-on-Tyne in July, 1929, the vessel was handed over on February 14, 1931, after a most successful series of trials. It is interesting to add that she is the first destroyer of the 1928 program to be delivered to the Admiralty. The builders also attained a similar distinction in the case of the 1927 program, when the *Active*, built and engined by them, was the first destroyer to be handed over.

The *Blanche* is the sixty-fifth war vessel constructed by this firm. They have now in hand, in addition to the hull and propelling machinery of the sister-ship *Boadicea*, the propelling machinery for two destroyers being built at Portsmouth Dockyard and for two sloops under construction at Devonport Dockyard.

The Modernizing of Naval Vessels

The Engineer, February 13.—In reply to a question which was recently put in the House of Commons as to which of the battleships and battle cruisers in the Navy list, other than the *Rodney*, *Nelson*, and *Hood*, had been modernized, Mr. A. V. Alexander, the First Lord of the Admiralty, stated that since 1918 nine ships of the *Queen Elizabeth* and *Royal Sovereign* classes had been brought up to date, as also had the battle cruisers the *Renown* and the *Repulse*, while the work on the *Barham* was now in hand. The main alterations, Mr. Alexander said, had consisted in the addition of bulges, the increase in some cases of the antiaircraft armament, and improvements to the bridges and tops. The ventilation and accommodation had also been improved. In the *Renown* and the *Repulse* additional armored protection had been given, and the total estimated cost of these items of modernization was approximately £2,870,000.

Imperial Defense College

London *Times*, March 9.—The cost of the Imperial Defense College at 9 Buckinghamgate is borne on the Navy estimates, and will amount in the coming year to £6,680, towards which appropriations-in-aid of £4,405 will be received from the War Office and Air Ministry. This college was opened in 1927 to train officers and civilian officials in the broadest aspects of imperial strategy, and the course lasts one year. The commandant is appointed in turn for two years from the Navy, Army, and Air Force. The rent of the college building is £1,107 a year, and there is a charge of £545 for the maintenance of the building. The pay and allowances of the commandant, instructors, and graduates are borne by the services to which they belong. As the commandant is at present an R.A.F. officer, Air votes include £4,018 for his pay and allowances and those of the R.A.F. instructor. Army votes include £1,620 for pay and allowances of the Army instructor. The approximate total cost of the college in 1931, exclusive of the pay of graduates and traveling expenses, will be £13,016.

Guns In Submarines

London *Times*, March 15.—Information released in the Navy estimates concerning the new British submarines shows that three distinct types are now under construction. The largest is represented by H.M.S. *Thames*, building by Vickers-Armstrongs, Barrow. She is to be of 1,760 tons with a length of 325 ft., and will carry a 4.7-in. gun. The next type is represented by H.M.S. *Rainbow*, completing at Chatham. She is of 1,475 tons, with a length of 271 ft., and is armed with one 4-in. gun. Then come the new small submarines of the S-type, named after marine creatures—*Swordfish*, *Sturgeon*, and so on—which will be of 640 tons, with a length of 187 ft., and will carry a 3-in. gun. The last-named type will be in the nature of a return to the coastal submarines of the R-type built during the war, which were of 700 tons and carried a 3-in. gun each.

FRANCE

The "Jeanne d'Arc"

Naval and Military Record, March 11.—The preliminary trials of the 6,500-ton cadet cruiser *Jeanne d'Arc*, on the way from St. Nazaire to Brest, have been satisfactory, her four small-tube boilers and Parsons turbines working smoothly at 24,000 hp. (75 per cent of the total paper power), and have given about 24 knots in rough weather. Sanguine expectations of 28 knots at full power are being entertained. She is now shipping her armament at Brest, and, after official trials, will in October next leave France, with about 150 naval cadets on board, as *croiseur ecole de la marine Française*. She will be a floating school, museum, and laboratory, and in that respect will have no counterpart in any other Navy. So complicated has become the naval art, so scientific its methods, that the need of such vessels as the *Jeanne d'Arc* will be felt sooner or later in all great navies. Moreover, ordinary fighting ships, absorbed by daily squadron routine, lack the many up-to-date installations necessary to a full apprenticeship of the fighting profession. The *Jeanne d'Arc* will be a miniature reproduction of the whole French war organization. The whole naval problem will daily face budding *officers de vaisseau*, whereas only part of that problem could be rendered familiar to them on board any other vessel.

The "Pluton"

Naval and Military Record, March 11.—The 4,800-ton minelaying cruiser *Pluton*, has commenced her preliminary trials off Lorient in very rough weather. She is a promising craft, considered by experts here as the most up-to-date minelayer in existence. Outwardly she resembles the *Jeanne d'Arc*. She has many points in common with the British 6,780-ton *Adventure*, which she excels for both speed and armament, but to which she is inferior for protection and radius of action, and perhaps, also, for handiness, being deeper in the water than the fine English minelaying cruiser. The *Pluton* will easily exceed her nominal 30-knots speed, and will prove a welcome addition to the Mediterranean Fleet this summer. There is no counterpart to her in the Italian Fleet. Our Southern friends, in truth, do not believe in minelaying cruisers; the game is too risky; number tells more than size in laying mine ambushes. The fifteen Italian minelaying gunboats, their six auxiliary minelaying cruisers (*Quarto*, *Ancona*, *Brindisi* classes), their thirty and more minelaying destroyers, without mentioning submarine minelayers, could do infinitely more mischief than the large French and English minelayers. There is something to be said for that view. The twelve 2,600-ton French *contretorpilleurs* in hand will carry mines. The 5,900-ton *Bertin Emile*, an improved *Pluton*, recently ordered at Penhoet, St. Nazaire, will be more of a cruiser; but the trials of the *Pluton* may bring about modifications in her designs. The new *croiseur mouilleur de mines* will serve as training ship for officers of the mining branch. Admiral Durand-Viel and other *grands chefs* are agreed as to the potential influence of mining tactics on warfare, especially in narrow European waters. The point is never lost sight of in the framing of combined maneuvers.

ITALY

Destroyer Trial Speeds

London *Times*, March 2.—The details of the trial speed of the new Italian flotilla leader *Alvise Cadamosto*, which have been reported by the *Times* correspondent at Rome, go to show that this vessel achieved a maximum rate about 2 knots faster than the *Nicoloso da Recco*, which was appar-

ently the previous holder of the record. On trial in April last the latter ship reached 41.504 knots. The *Alvise Cadamosto* is reported to have averaged 41 knots and to have made a maximum of 43.5 knots. The designed speed was 38 knots. A reliable comparison with contemporary vessels of other navies could not be made because of the varying conditions of loading, wind and weather, depth of water, and the like. In the Royal Navy for many years attempts at a high rate of speed on trial have been discouraged, the aim having been to produce vessels which could maintain a fair average rate on service. The first three of the new *Beagle* class destroyers to be tried all exceeded their contract speed without any trouble. They were designed for 35 knots. The *Blanche* made a speed of 35.76 knots, the *Brilliant* of 35.56 knots, and the *Boreas* of 35.75.

Keel of New Cruiser Laid at Leghorn

Baltimore *Sun*, March 3.—The keel was laid for the 10,000-ton cruiser *Pola*, the first Italian naval construction begun since the Anglo-French-Italian naval accord was reached.

It is hoped the *Pola* may be launched in December, equaling the record of its sister-cruiser, the *Gomizia*, the keel of which was laid last March and which was launched December 28, breaking a world record for such construction.

Miscellaneous

Le Yacht, March 17.—The Navy budget for 1931-32 carries a total of 1,573 million lire, or 87 million more than the preceding year. The amounts assigned to naval construction are 125 million more than the previous year. They now reach a total of 725 million, or 46 per cent of the total budget of the Navy, against 41.5 per cent in 1930.

Such at least are in the official figures. But, as is well known, it is impossible to know what Italy actually spends for her Navy or her Army, as the ministers of national defense have the right to make expenditures with the consent of the Council of Ministers without informing either Parliament or the public.

The submarine *Argonauta* was launched on January 19 at the Monfalcone yards. It displaces 609 tons, and has a length of 61 meters. Two more submarines are to be launched at the same yards during 1931.

The submarine *Settembrini* has had its trials off Taranto. It has a surface speed of 18 knots.

The submarine *Fratelli-Baniera* of 850 tons attained a depth of 107 meters in its diving tests.

GERMANY

The "Ersatz Preussen"

Army and Navy Journal, March 28.—A Berlin message states that May 31 has been fixed for the launching at Kiel of the *Ersatz Preussen*, the first of the new program of armored ships for the German Navy. The date is the anniversary of the Jutland action, which it is still sought to commemorate in Germany as a great and glorious victory for the Fatherland. The keel of the ship was laid at the Deutsche Werke in September, 1928. For a ship of such novel design, and remembering the post-war conditions in the German warship building industries, this may be regarded as creditable. According to Lieutenant Commander von Baumbach's article in the new issue of *Brassey's Annual*, these new armored vessels should take four years to build, and the replacement program laid before the Reichstag by the government in the 1931 budget provides for the beginning of three more such ships in the years 1931, 1932, and 1934. He shows that these much-discussed units are necessary in that the seven battleships of the *Braunschweig* class are not adapted to modern offensive weapons (depth charges, torpedoes, mines, and bombs), as they were built at a time when such weapons were not developed. "Only armored ships of the *Ersatz Preussen* type are capable of performing essential military duties."

As regards the design of these ships, Lieutenant Commander von Baumbach shows that on account of the immense difference in the maximum displacement allowed to Germany under the Versailles Treaty (10,000 tons) and that allowed to the maritime powers under the Washington treaty (35,000 tons), the German Navy has attempted to create a new type of ship which, while possessing a fairly heavy main armament (six 11-in. guns, sufficient light guns, and four torpedo tubes), shall have

also the mobility and radius of action of a cruiser. Her speed is 26 knots, and she is driven by internal-combustion motors. This German officer says:

> This class of ship is naturally more powerful than the Washington cruisers if both are regarded as armored ships; but it is not on that account logical to regard them as menaces to other powers. They are ships of the line, and as such are far weaker than those possessed by other countries. Technical authorities all over the world have admitted that the construction of these ships proves that it is possible to build a vessel capable of fighting and resisting as a battle-worthy unit, without building an enormous ship of 35,000 tons displacement.

Hence the view held in certain quarters that these new ships may be the successors of the great battleships of today, providing that they are capable of performing all the duties of capital ships.

MERCHANT MARINE

California Nautical School

Neptune Log, March.—California's Nautical School is now a reality. The school opened January 29, 1931. Some hundreds of young Californians at ten educational centers took competitive examinations for the coveted prize of completing their education on the schoolship. The young men who qualify will be among the best, since it is required that they be:

(1) Of good repute,

(2) Legal residents of the state of California and citizens of the United States,

(3) Not less than seventeen years of age,

(4) Sound in body and free from physical defects,

(5) Able to pass a competitive mental examination,

(6) Provided with entrance fee, not to exceed $150, and such items of clothing as may be prescribed,

(7) Enter the school voluntarily with a fixed and earnest purpose of completing the course, and becoming officers of the United States Merchant Marine.

The physical tests are very comprehensive and, if passed, would qualify the applicant for the very highest insurance rating. The mental examination, while not difficult, would require a thorough grounding in subjects covered, such as simple mathematics, United States history, grammar and rhetoric, general information.

It is obvious that only those boys who are "of excellent character and rugged in physique" need apply with the hope of passing these tests. But even if these tests are passed there is the further barrier of adaptability to life on shipboard where each boy must prove himself "amenable to discipline and earnest in application with an honest and sincere purpose. No applicant will be admitted to the school who, in the opinion of the board of governors, is unfitted for a life at sea; nor will any cadet be allowed to remain in the school unless he promptly, consistently, and willingly obeys all the rules and regulations for the government of the school and makes consistent and satisfactory progress in his studies and training." Since all work connected with the maintenance and operation of the ship both at sea and in port is to be performed by the cadets, it is plain that this two-year course will require lads of a resolute spirit who are willing to endure "hard and consistent mental and physical work" and the discomforts and privations incident to life at sea.

The board of governors of the California Nautical School are the type of men who will carry out the spirit and letter of these regulations, and we predict that the graduates of this school will be greatly in demand as officers in the American Merchant Marine.

American Shipyards Busiest Since War Days

Nautical Gazette, March 7.—With 27 ocean-going vessels of 325,400 tons and 122 miscellaneous vessels, including ferries, barges, tugs, trawlers, lighters, and yachts bringing the total tonnage to 428,748 tons, building in the United States on March 1, American shipyards are busier than at any time since the World War, Capt. C. A. McAllister, president of the American Bureau of Shipping, points out in the bureau's current report. The report is good to read, showing construction contracts well distributed. The healthy condition of shipyards right now is particularly timely, as it helps relieve the unemployment situation, making work available for thousands of men directly and thousands more indirectly.

Of the 27 ocean-going vessels now under construction, 19 are building under provisions of the Jones-White Act of 1928.

Since the American bureau report was released, the Eastern Steamship Lines has let

a contract to Newport News Shipbuilding and Dry Dock Company for construction of two 6,000-gross-ton passenger liners, to cost $7,000,000.

The New York Shipbuilding Company is building the two largest liners under way. They are the 30,000-ton transatlantic liners building for the United States Lines. This yard has on the ways also two 9,400-ton passenger and cargo vessels for the Export Steamship Corporation, the last two of a quartet to go into the Mediterranean trade. Two of these, the *Excalibur* and *Exochorda,* are in service, and the last two, the *Exeter* and *Excambion,* will be completed soon.

Newport News has under construction two 21,000-ton liners for the Dollar Line, the *President Hoover* and *President Coolidge;* three United Fruit liners, each of 7,000 tons (United Mail Line); one 5,000-ton liner for the P. & O. Steamship Company. Since the report was compiled, Newport News has signed a contract for the Eastern Steamship Line's two new 6,000-gross-ton ships.

The Federal Shipbuilding Company, of Kearney, New Jersey, has under way four 11,000-ton liners for the Grace Line's Panama Mail service. Aside from these, and not included in the bureau's report, are the five Baltimore Mail liners being reconstructed at Federal for transatlantic service.

The Sun Shipbuilding Company, of Chester, Pennsylvania, has on the ways six 9,000-ton tankers, five for the Motor Tankship Corporation, and one for the Standard Transportation Company.

Bethlehem Shipbuilding Corporation, of Fore River, Massachusetts, is building three 18,500-ton liners for the Matson Line, *Monterery, Mariposa* and *Lurline;* and three 7,000-ton ships for the United Fruit Company (United Mail Line); also an oil tanker of 6,100 tons.

The Course in Ship Operation at the Massachusetts Institute of Technology

Merchant Marine Bulletin, March.—By LAWRENCE B. CHAPMAN.—In 1925 a new and unique course of training was established at the Massachusetts Institute of Technology to prepare men for the fields of ship operation and shipping administration. The course is a combination of science, engineering, economics, and business studies, especially prepared to train men for the shore end of ship operation and management. As the scope of the course is broad and emphasis laid upon fundamentals, it should also serve as a foundation training for other related fields, such as port administration, terminal engineering, marine insurance, and admiralty law.

Up to the present time shipping has been one of the few industries which has not made a regular practice of drawing on the technical school for recruiting the ranks of its shore personnel. However, with the building up of our merchant marine to compete with foreign shipping this policy of our steamship companies must change and the technically trained man will find a wider sphere of activity in this field in the future.

The course in ship operation is under the direction of the Department of Naval Architecture and Marine Engineering and covers a period of four years of study at the institute. Eventually the course may be made a coöperative course of longer duration in which the classroom training will be interrupted by practical training at sea, on the piers, and in the steamship office.

The first two years are much the same as other courses at the institute and include such basic and cultural subjects as mathematics, physics, chemistry, English, history, economics, and drawing. The last two years are given over to more advanced work in engineering and economics and the specialized studies in the field of ship operation. The following table shows the percentage of time devoted to the various groups of studies:

	Per cent
Physics and chemistry	16.7
Mathematics	9.3
English, history, and general studies	9.3
Mechanical engineering subjects	18.0
Mechanic arts	1.6
Electrical engineering	3.6
Naval architecture, ship construction, and design	7.0
Marine engineering	4.9
Ship operation, terminal facilities and thesis	6.2
Economics and business studies	19.8
Physical training and military science	3.6
	100.0

The work in mechanical engineering includes mechanism, applied mechanics, heat engineering, and engineering laboratory. In addition to these studies in the classroom and laboratory, the student has practical shopwork in forging, foundry, and machine tools.

The instruction in economics, in addition to the general course in political economy, covers such subjects as accounting, banking, corporate organization and finance, statistics, business law, and industrial relations.

The student is given instruction in naval architecture, ship construction and design, and in the drawing-room he becomes familiar with the rules of the classification societies, and works up a preliminary design. In presenting this part of the work the point of view of the shipowner is stressed more than that of the designer, and naturally the ground covered is not as extensive as that given to the students in the course in naval architecture and marine engineering. As a thorough knowledge of the economics of the ship's power plant is very important to the man who may eventually be responsible for its selection and operation, special emphasis is given to marine engineering. All types of propelling and auxiliary machinery, both steam and Diesel, are studied and considerable attention is given to the selection of the most suitable machinery for various types of ships and trade routes. Methods of attaining and maintaining low fuel consumptions are particularly stressed.

Three special courses are given in the field of ship operation. One deals with shipping business methods, freight and passenger traffic, chartering, marine insurance, the principles of admiralty law, etc. A second course deals with the ship in port and takes up a study of marine terminal design and operation, cargo handling, longshore labor, the interrelation of land and marine transportation, and other factors in ship and terminal design making for a quick turn-around of the ship in port. Attention is also given to the layout and functioning of some of the world's leading ports. The third course deals with the economic and engineering aspects of cargo and passenger ship operation, trade routes, cargo rates, cargo and passenger movements, and other phases of marine transportation. The classroom work deals with coastwise and inland water transportation as well as ocean shipping and such subjects as the proposed St. Lawrence waterway and the free port are fully discussed. In addition to the lectures given in this subject, the student is assigned numerous practical problems in which the various items of operating expenses and revenues are worked out for given ships on various trade routes. Many of these problems are of a comparative nature in which size, speed, type of machinery, and kind of fuel, etc., are varied for an assigned trade route. In this way the influence of these various factors on the economics of ship operation is brought home to the student.

The majority of the students now enrolled in the course are enthusiastic about ships and shipping, and many of them have spent one or more summers at sea in order to obtain practical experience. One student has secured his master's papers and another his first engineer's license before entering the institute. Several students have graduated from this course during the past four years, but the first regular class, consisting of six men, will be graduated this June.

It is hoped that this course in ship operation will make a real contribution to the advancement of the American Merchant Marine by supplying a group of men who will have a technical knowledge of ships and their power plants, a training in business methods, and a grasp of the economics of ship and terminal operation.

ENGINEERING

Marine Boiler Development Since the War

Merchant Marine Bulletin, March.—By Mr. J. H. King.—Marine engineers and the marine industry in the United States are today unquestionably leading the world in clear thinking and application of propulsion equipment for ships. The extensive use of modern steam machinery with higher pressures and temperatures is the result of a thorough study of all types of propulsion as well as a sound analysis of the economic factors involved. The high economy obtained on our modern steamships furnishes the proof of this clear thinking.

The development in marine boilers has been one of the important factors in the utilization of higher pressures and temperatures in ship propulsion equipment. During the war our extensive building of cargo boats comprised machinery that included many Scotch boilers of 200-pounds pressure and water-tube boilers largely of the 4-inch header type with 200 pounds pressure and about 50 degrees F. superheat. The transports built during this period used 2-inch tube water-tube boilers of 265 pounds pres-

sure and 50 degrees F. superheat. At this time our Navy used pressures of 295 pounds and 300 pounds, with only a few ships using superheat.

In the majority of ships, oil was used for fuel. In the water-tube boilers, furnaces were lined exclusively with firebrick and the superheaters were of the convection type located on top of the boiler.

The use of higher boiler pressures has quite naturally led to the adoption of water-tube boilers. Pressures now in use and contemplated make the mechanical practicability and cost of Scotch boilers prohibitive, so that today practically all of the large steamship lines and many of the smaller lines are using water-tube boilers with success.

In 1924, 280-pound pressure boilers were installed in the SS. *Malolo* of the Matson Navigation Company, and in the Great Lakes steamer *John W. Gates* of the Pittsburgh Steamship Company. The SS. *Malolo* also used 100 degrees F. superheat while the SS. *John W. Gates* did not use superheat.

In 1925, boilers of 275 pounds pressure and 150 degrees superheat were installed in the SS. *Iroquois* and *Shawnee* of the Clyde Line and the SS. *California* of the Panama Pacific Line.

The first merchant ship in this country to use a pressure in excess of 300 pounds was the SS. *Dixie* of the Southern Pacific Steamship Lines in 1926. These boilers were built for a working pressure of 350 pounds and 150 degrees F. superheat. They marked a new development, in that superheaters were installed within the tube bank of the boiler instead of on top of the boiler. This location of the superheater was necessitated by the temperature of 150 degrees F. desired, as the so-called "top side" superheater could not be used for superheat over about 100 degrees F. These boilers were also fitted with air heaters.

The air heater arrangement is somewhat different than that used on the *Dixie*, but otherwise the equipment is similar to that installed on the *Dixie*.

The next development was the use of higher pressure and superheat boilers, fired by underfeed stokers. Boilers of this type were first installed in the SS. *Carl D. Bradley* of the Bradley Transportation Company in 1926. These boilers were unusual on account of the very large, high furnace required for use with this stoker which resulted in a very high boiler. The boilers were built for a working pressure of 325 pounds and 280 degrees F. superheat.

A few years later, in 1929, an installation of chain grate stokers was made in the Pere Marquette Railway Company car ferries *City of Saginaw* 31 and *City of Flint* 32. This type of stoker was installed in the same headroom as an oil-fired furnace. These boilers were built for a working pressure of 315 pounds and 200 degrees F. superheat.

Another development has been the practical application of powdered coal. Installations have been made with great success on the steamers *West Alsek, Berwindglen,* and others.

The progress in oil-burning apparatus has reached a very high state of efficiency. Boilers can now be designed to use any kind of available fuel. Furnaces designed for one type of fuel can be readily converted to use any other type of fuel when the cost or supply warrants its use. This is one of the great practical advantages of the modern marine boiler.

Several other ships were built during these years using higher pressures and temperatures, but with oil fuel. In 1929 the Sinclair Navigation Company laid down two tankers equipped with boilers built for a working pressure of 375 pounds and 200 degrees F. superheat. In this same year the Standard Shipping Company laid down two tankers fitted with boilers built for a working pressure of 420 pounds and 300 degrees F. superheat, or a total temperature of 750 degrees F.

The Matson Navigation Company have laid down three ships with boilers designed for a working pressure of 400 pounds and 208 degrees F. superheat. The SS. *Borinquen* of the New York and Porto Rico Steamship Company is also fitted with boilers designed for a working pressure of 400 pounds. These boilers furnish 158 degrees F. superheat. All of these ships with the exception of the *Borinquen,* are also fitted with air heaters. These boilers are all of the sectional header type fitted with 2-inch tubes with the exception of the bottom, or furnace row, which are 4-inch tubes. All of these boilers are designed for burning oil fuel.

Another development in high pressure boiler design is the three-drum type of boiler

being installed in the new 705-foot cabin liners under construction for the United States Lines. These boilers are lighter in weight than the sectional header type boiler. Although not quite as rugged, boilers of this type are suitable for large high-powered ocean liners where weight is the controlling factor. Boilers of the three-drum type are used more extensively abroad than in this country.

In boilers of the design being installed in the new United States Lines ships the first two, or fire, rows of tubes in each bank are 1½ inches in diameter and the remainder of the tubes are 1¼ inches in diameter. Interdeck superheaters are fitted as well as air heaters. Safe pressures for which boilers of this type are suitable are quite limited. Increased pressures will result in either an increase in the drum thickness or an increase in the ligament between the tubes. Since there are a great many tubes entering the upper, or steam drum, an increase in the ligament between the tubes will result in spacing the tubes in such a manner that the boiler is not as good a heat strainer, so that the boiler efficiency is materially decreased. It is then essential to either use an air heater or an economizer in addition to the boiler itself, in order to obtain satisfactory overall boiler plant efficiency. Of course, the use of air heaters and economizers of present designs add considerable weight to the boiler plant.

If the drum thickness is increased to obtain higher pressures, the drum plate required may be of such thickness that it is not practicable, particularly for riveted drums. If seamless steel forged drums are used, the weight and cost of the boiler are very greatly increased.

Therefore, the need for a boiler that would be suitable for any desired pressure and at the same time be light in weight, compact, and give a very high boiler efficiency with a low stack temperature, led to the development by the Babcock and Wilcox Company of the new sectional express type boiler. Boilers of this type are being installed in the new scout cruisers *New Orleans, Astoria,* and *Minneapolis,* and will also be installed in the new airplane carrier *Ranger* under construction by the Newport News Shipbuilding and Dry Dock Company. The great saving in space and weight, together with the high efficiency that can be obtained even at very high pressures, make the development of this boiler a marked advance for fast high-powered liners as well as for naval work.

The construction of this boiler is in some ways similar to the usual sectional header type boiler except that the headers are cylindrical, thus permitting of grouping a large number of tubes that are accessible for expanding, inspection, and cleaning from a single handhole plate. The arrangement of the cylindrical headers with a decreasing area of gas passes through the boiler results in uniformly high rate of heat transfer. A superheater which is of the interdeck type is located above the lower bank of generating tubes. These tubes are often referred to as a water screen, since they screen the superheater from the radiant heat from the furnace.

The first two, or fire, rows of tubes are 2 inches in diameter and the remainder of the tubes below the superheater are 1½ inches in diameter. All the tubes above the superheater are 1¼ inches in diameter.

This boiler makes a very light weight, compact, highly efficient unit and marks a new era in marine boiler construction.

Along with development in the boilers there has been considerable advance in boiler appurtenances. Several types of superheaters have been developed, including interdeck and top side superheaters heretofore mentioned, as well as the radiant type of superheater. Radiant type superheaters consist of superheater tubes located so that they are exposed to the direct radiant heat of the furnace. These radiant type superheaters are more apt to be damaged under maneuvering conditions than the interdeck type and it is believed that the radiant type has not been proved to be as suitable for the small marine furnace as the interdeck type of superheater.

In order that there may be a sufficient quantity of steam flowing through the superheaters when there is a large auxiliary saturated load on the boilers, desuperheaters have been developed. These desuperheaters are designed so that all the auxiliary steam passes through the superheater and then is desuperheated down to a point where the steam can be satisfactorily used in the auxiliaries.

With higher pressures and temperatures, exit gas temperatures from the boiler in-

crease. In order to take advantage of the heat available in these gases, various forms of heat recovery apparatus have been developed. These usually consist of either air heaters or economizers. In all the passenger ships now being constructed in this country that use heat recovery equipment, air heaters are used in preference to economizers.

There has been a very great development in increasing the amount of oil that can be burned in the small marine furnace. With oil burning apparatus designed so that it will efficiently handle oil in a small furnace, it has been found possible to burn oil at rates as high as 300,000 B.t.u. per cubic foot of furnace volume per hour with a very high overall boiler efficiency. Many merchant ships are in successful operation burning oil at the rate of 75,000 B.t.u. per cubic foot of furnace volume and experiments have shown that the efficiency has decreased very slightly when this rate is materially increased. It has also been found by experimental and research work that the use of a larger furnace to reduce the fuel rate below this point makes no appreciable difference in efficiency.

Of course, all the above is dependent upon the use of oil burning equipment that can efficiently burn the oil in the small furnace.

In some cases water walls have been installed. Water walls are quite extensively used in stationary work where very high furnaces are used, but considerable experience in marine work has demonstrated that the use of water walls in a small marine furnace, will cool the furnace gases to such an extent that the boiler efficiency is materially lessened. In some cases when burning coal, particularly when stokers are used, water walls are installed in parts of the furnaces with success, but in these cases the purpose is to prevent slag formation.

The above is a brief outline of the developments in marine boilers which have contributed to the great economy in modern steamships.

The low first cost; the unlimited availability of fuel, since coal, oil or any other type of fuel can be used in the boiler; the very low operating cost; high efficiency; the thorough reliability of machinery, and the very low upkeep and maintenance costs are among the principal advantages obtained by the use of modern steam machinery.

The use of modern steam equipment has resulted in ships operating at .61 pound of oil per shaft horsepower for all purposes. This oil consumption combined with the very low cost of boiler fuel represents the lowest cost of fuel per shaft horsepower per hour of any propulsion system now in use.

The development in marine boilers has therefore contributed to the great increase in economy obtained with higher pressures and temperatures since thoroughly reliable and efficient boilers that can use any kind of fuel are available to furnish the modern steam conditions that result in the great gain in thermal efficiency and reduction in water rate of the turbines and engines. The trend is toward still higher pressures and temperatures than those already in use so that even greater economy in steamships may be expected in the future.

Largest Mercury-Vapor Turbine to Be Erected by General Electric

Nautical Gazette, March 21.—A 20,000-kw. mercury-vapor turbine generator is to be installed in Schenectady in a new power plant that will be outstanding in several respects, according to Burton L. Delack, manager of the Schenectady works of the General Electric Company.

In addition to the 20,000-kw. mercury boiler and turbine operating on 13,800 volts, the new outdoor station will include a steam boiler to supply 300,000 pounds of steam per hour, in addition to the by-product output of 330,000 pounds per hour from the mercury condenser, for process, heating and testing steam in the G. E. works. Adjacent to the power-station site is the substation, through which the electric energy from the mercury turbine is supplied to the 110,000-volt transmission system of the power company.

The mercury required in the boiler will weigh a quarter of a million pounds—but so heavy is this liquid metal that such a weight occupies a cubical space less than 7 feet on a side.

The mercury-vapor process is an invention of W. L. R. Emmet, of the General Electric Company. After preliminary experimentation, a trial equipment was built and operated in the Schenectady plant, from 1915 to 1917. In 1923 a combined mercury and steam power unit was built for the Hartford Electric Light Company. This was the first mercury-vapor power installation

in the world. The practical operating experience obtained with this first unit led to the construction of a 10,000-kw. mercury-vapor turbine, installed in the South Meadow station at Hartford. The records of the Hartford installation show a substantial saving in fuel over usual steam generating equipments.

Briefly stated, mercury offers decided advantages over water in turbine operation, because it boils at a much higher temperature. The efficiency of any heat engine may be increased by increasing the temperature range through which it works—it is for this reason that steam turbines have been constructed to operate at higher temperatures and higher steam pressures. The properties of mercury are such that high temperatures can be obtained without high pressure. For example, mercury vapor at a temperature of 958 degrees F. has a pressure of 125 pounds gauge, while steam at a temperature of only 569 degrees F. has a pressure of 1,200 pounds gauge.

At the exhaust end of the turbine the mercury vapor is still hot enough to boil water and make steam at pressures which are in common use. Therefore, instead of circulating cooling water through the mercury condenser as in the ordinary steam condenser, a level of water is held in the condenser just as in a steam boiler. The water boils and makes steam. A large part of the power generated from the mercury turbine is obtained at very high efficiency, since the heat in the exhaust is not lost but is used in the steam production.

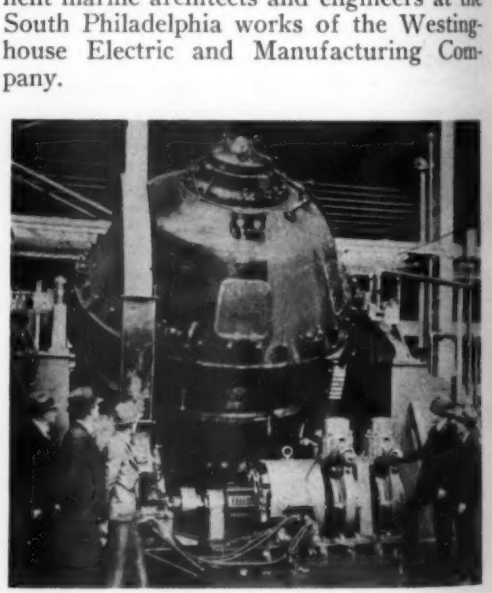
The design of the unit was based on generating 20,000 kw. from the mercury turbine and 240,000 pounds of steam per hour made by condensing mercury (the additional 90,000 pounds of the 330,000 pounds already referred to is obtained from the water walls). The doubling of the Hartford capacity will be obtained by increasing the mercury pressure to 125 pounds gauge and by installing mercury heating surface on the upper portion of the furnace walls. By thus protecting the furnace walls, the heat liberated in the furnace can be greatly increased over that at Hartford, where the furnace walls are air-cooled. Moreover, the combustion air can be preheated to a higher temperature than was considered desirable with the Hartford furnace. Therefore, a low flue gas temperature to the stack can be obtained without the use of a water economizer. This will permit a greater application of regenerative feed heating with the steam cycle in case condensing steam turbines are used for generating power.

When pulverized fuel is burned, the lower portion of the furnace walls should for the present be protected by waterheating surface. The fuel economy will be somewhat impaired with this arrangement of furnace, as addition fuel is needed to generate steam directly in the furnace walls. Further experience is needed before the entire furnace walls can be protected with mercury heating surface.

With a load of 20,000 kw. on the mercury turbine and with the power developed from the 240,000 pounds of steam generated at 400 pounds pressure and 350 degrees F. by condensing the mercury vapor, the expected fuel rate will be 8,800 B.t.u. per net kilowatt-hour. With water cooling in the lower part of the furnace, the fuel rate will be from 9,100 to 9,500 B.t.u. per new kilowatt-hour, depending on the amount of steam generated directly in the water-cooled furnace walls.

Experts View Test of Gyro-Stabilizer

Nautical Gazette, March 28.—An 11-foot gyro-stabilizer, weighing 120 tons and designed to prevent rolling of a ship in a seaway, recently was tested before prominent marine architects and engineers at the South Philadelphia works of the Westinghouse Electric and Manufacturing Company.



ELEVEN-FOOT GYRO-STABILIZER

The huge "top," weighing 110,000 pounds, spins at a speed of 930 r.p.m. within the stabilizer casing, spun by a built-in 200-hp. motor.

The stabilizer was built by the Westinghouse Company to the order of the Sperry Gyroscope Company, of New York, for a foreign shipbuilder.

Engineers at the test said the gyro, precessed by an external electric motor of 75-hp., would keep a 450-foot ship within 2 degrees maximum roll. Almost an hour is required to get the 55-ton rotor up to its speed, and when power is cut off the rotor it will revolve of its own momentum for more than two hours. The stabilizer is one of the largest ever constructed. A smaller one was ordered recently by the Italian government for use in an Italian warship of 2,000 tons.

The Lloyd Sabaudo Steamship Line, has contracted for three stabilizers to be installed on the Lloyd Sabaudo super-liner *Conte de Savoia,* now being built.

A separate turbo-electric power plant of 360 kw. is required to operate the gyro-stabilizer.

AVIATION

Organization of French Naval Aviation

La Revue Maritime, November, 1930.—(Note: The first part of this article appeared under the Professional Notes Section of the Institute PROCEEDINGS—April, 1931, Issue).—The logical solution of the problem of organizing naval aviation is founded, not upon coöperation, but upon unity of command. The primary objective of naval aviation is the protection of maritime routes, which is essentially a naval problem. The conquest of the air over the sea cannot be considered an object in itself, like the conquest of the air over inhabited territory; it remains a means, not an end. The real object being to gain control of the surface, all the forces engaged in accomplishing that object are naval forces.

But, in our solution of the problem, we should not return to the former organization of naval aviation, which was bad. There was a so-called Central Aëronautical Service (S.C.A.) which contained its own operating bureaus, separate from those of the Naval General Staff (E.M.G.) with the result that little interest was taken in its affairs. The administrative and technical divisions of the S.C.A. constituted an abnormal condition in the Ministry of Marine. The technical division depended on the Direction Generale de l'Aeronautique of the Ministry of Commerce for purchases and tests of its aircraft.

Happily, the flying personnel of the Navy remained excellent, and the faults were principally those of material, but in this matter naval aviation was but suffering from a cause common at that time, a crisis of material. But with the advent of efficient flying boats, of catapults, and other new material, the utilization of this material again assumes importance. We find an excellent example of the way this should be done, in the organization of naval aviation in the United States, which is founded on the principle of "unity of command in view of the object to be attained."

Their organization was the object of continued attacks between 1920 and 1925, and the controversy was decided by the Morrow board, appointed by President Coolidge. The report of this board contained a categorical recommendation against the establishment of an air ministry, but as a result of its recommendations, naval aviators were assigned to duty in Naval Operations and various bureaus of the Navy Department. Unity of command in view of the object to be attained was thus accomplished.

The Morrow board also recommended the establishment of the offices of the assistant secretaries of War, Navy, and Commerce, who are specially charged with duties connected with aëronautics, a solution which has given excellent results, as these officials act to coördinate the three branches of aviation.

The personnel of American naval aviation belongs entirely to the Navy. Since 1925, all midshipmen are given theoretical and practical instruction at the Naval Academy, but none are sent to the naval air school at Pensacola until two years after graduation.

The result of this organization is that naval aviation in the United States is much ahead of all others in the world; their Navy is distinguished by the prodigious development of its aviation, and particularly of its employment. It was the first to employ catapults, and it holds enviable rank among world's records.

Such are the brilliant and solid results ob-

tained by an organization founded upon unity of command, but which does not exclude a sufficient liaison with other branches of aviation. The effect of a similar organization upon their commercial aviation has been equally remarkable, the motto being to earn money by means of fast transportation. The Western Air Express has just paid dividends to its stockholders, an unheard-of incident in commercial aviation.

The American solution, which is the logical solution, consists in separating the various branches of aviation, and it is easy to see that there cannot be unity in the employment of aviation, but only in the general technical qualities of the flying machines. Employment is either military or commercial, and the former is divided into aërial defense of frontiers and territory, on the one hand, and the defense of lines of maritime communications on the other hand. As to the technical qualities of aircraft, these tend more and more towards division, and a single technical service will sooner or later have to be separated into several branches, which practically means several technical services.

The amount of American aviation budgets combined has been cited to prove that their system is too costly for France ($120,000,000). But when it is considered that the French expenditures for aviation amount to half that sum, and that the United States is three times as populous and six times as large as France, and when the results in the two countries are compared, the American solution appears not only more advantageous than the French, but proportionally cheaper. Liaison between the various technical services in America is assured by the National Advisory Committee for Aëronautics, and the Germans possess the remarkable Deutsche Versuchsanstalt für Luftfahrt, which is responsible for the considerable advance which has been gained over Germany's European competitors in commercial aviation.

In France, the Service des Etudes, Essais et Experiences is composed of laboratories and flying fields scattered between Chalais-Meudon, Saint-Cyr, Issy-les-Moulineaux, and Villacoublay. This bureau should become a real institute of the air, but it must be distinct from the technical services of war, navy, and commerce.

Thus, the American example shows that a separate department of aviation is not only illogical from the military or commercial points of view but is useless in trying to perfect the material. It proves that, if separation of the three branches of aviation is indispensable for its efficient employment in each branch, this separation in no way impedes technical progress. The American example also proves that coördination among the three branches can be perfectly realized by a directing organization similar to the triumvirate of the three assistant secretaries.

Our organization will be founded, imitating the American solution, upon the principle of unity of command in view of the object to be attained. Now, the first and principal object of naval aviation is the same as that of the Navy: the defense of maritime communications.

(The author then outlines his proposed aëronautical organization, working it into the present organization of the naval general staff, putting construction in with naval construction, with its own technical service. With regard to the personnel, he copies the American system and quotes the recommendations of the Morrow board on this subject.)

The partisans of the Air Ministry see in it a means of realizing a department of national defense. Without wishing completely to discuss the pros and cons of this idea, let us recall that it has not been adopted by any great power, even those which have air ministries. In the United States, a proposal of this sort was rejected by Congress in 1922 and opposed by the Morrow board in 1925. In England, the Imperial Defense committee's opinion is contrary to the project. The principal reason against the establishment of such a department is evident: in time of war the organization of national defense is not limited to the Army or the Navy or the air departments, but includes all government departments, commerce, labor, interior, agriculture, etc. The real department of national defense is the government itself.

The Army and the Royal Air Force

Army, Navy, and Air Force Gazette, February 19.—An intelligent foreigner listening to the many speeches of well-known people in this country in favor of the abolition of war might say a little cynically that the principal war waged at present in the country

was between two of the King's armed services—the Army and the Royal Air Force. He would be wrong in his belief, as most of the trouble which lies between these services is due to the ill-advised activities of people outside their bounds; yet there is a jealousy between the two services which should be removed. Coöperation is essential between all fighting units and rivalry is definitely evil. Each has its proper place in the theater of war, and if those places were decided upon in advance there would be no room for jealousy.

The Royal Air Force is young in years even though it may be the heir to centuries of tradition. It was formed as the result of squabbles more directly concerned with the supply of material than with the opinions of the *personnel*. In its twelve years of existence it has proved to the world that this country is supreme in military aëronautics even though there are other air arms of much greater numerical strength in men and machines. With its youth there is linked a sensitiveness which often leads its members to take offence at criticism which would be ignored by the older and more hardened services.

In a quite unnecessary attempt to justify its existence it is seeking a place in the sun which brings it into direct conflict with the theories of the other services. The Royal Air Force seeks to prove, by acts and by an extension of influence, facts that nobody denies—its efficiency and zeal. As a result there is still much discussion as to whether or not it can take over more of the duties of the Army and the Navy in various parts of the Empire. It has been responsible for the preservation of peace in Iraq for a long period and in Palestine and the Aden area for a shorter period. Its protagonists would like it to take the primary part in the defence of the northwest frontier and an enquiry into that matter is now proceeding. These are matters of high importance which can only be settled by the committee of Imperial Defense and by the Cabinet, but they rest upon what appears to be a much smaller matter—close coöperation between the three services.

It cannot be denied that the present position in regard to coöperation is not satisfactory. In this matter the Army has good reason for complaint though none is made. In any future war aircraft will provide one of the most devastating weapons. Even if the exaggerations of the alarmist writers are ignored, there is no doubt that movements on land and sea will be made under a constant and powerful threat of attack from the air and with the certainty of disaster if mistakes are made. That much we know. How are we preparing for the future? Spectators at the annual Army exercises are still wondering. The effects of the employment of armored fighting vehicles are obvious and often blind the observer to all other changes in the art and practice of war. Why? Because there are so few Army cooperation squadrons of the Royal Air Force that no good imitation of a carefully planned air attack can ever be given. Ground fighters are therefore apt to ignore the upper air until the moment of theoretic danger (as expressed by a few aëroplanes representing a host) causes a temporary diversion. Mimic war is an essential preparation for real war and its mimicry should be as close as possible to reality.

The Royal Air Force also has its exercises each year, but not always at the same period as are the Army exercises. Could not the two series be combined, even in part? Then when rival armies operate in the Salisbury Plain area the Royal Air Force could intervene much as it would in war and with surprising results on the tactical outlook (if not the strategical outlook) of the rank and file. Aircraft would be seen in relatively large numbers and the air weapon would be obvious to all. It would all be part of the "mechanization" which now rules military thought and each part of the machine would take its proper place. None would be in undue prominence because of the actual absence of another.

Whoever invented the phrase "air mindedness" did an evil thing in the military sense. In the art of war there is no room for any particular kind of "mindedness." Air and land warfare are not separate but are essential parts of one whole—war in being. The supreme commander, and there can only be one for a force composed of land and air units, must prepare his scheme of operations as a composite whole with air and land units in their set places. Future wars will not be won either on the land or in the air, but by action taken both below and above. Coördination of effort and cooperation in spirit and action will be the

principal elements of victory, as they have always been.

There is one other point of complaint that as the Army Coöperation Squadrons belong to a different service from the Army, senior officers in the Army who have air units under their direction in mimic war are unwilling to attribute blame to erring air formations with the same force and simplicity of language which they use when pointing out the errors of subordinates in their own service. And that is good neither for the Royal Air Force, the Army, nor the proper education of the fighting man. There is an obvious solution.

A Remedy for Ice Formation on Aircraft

Baltimore *Sun*, March 31.—Victory was reported here today over one of the aviator's most dangerous enemies—ice that forms on the wings of his airplane and sometimes causes it to be wrecked.

Through low-hanging clouds, at freezing temperature and an altitude of 2,000 to 3,000 feet, Charles Meyers, of Cleveland, piloted his airplane which was equipped with rubber "overshoes" developed by the B. F. Goodrich Rubber Company, the National Air Transport, Inc., and Dr. William C. Geer, Cornell University research associate.

The overshoes—pouches of specially treated rubber fabric fitted over the leading edges of the plane wings and struts—were made to "breathe" as the ice formed on them. As they breathed the ice crumpled away.

The inflation and dilation, which worked like a man's lungs, were created by a motor-driven air pump in the cockpit. The ice was quickly discarded, Meyers said, adding that the process involved no noticeable change in the plane's flying character.

Dr. Geer's first idea was to find a compound to which ice would not adhere. Scores of substances to paint or smear over the wings and struts were tried, a great variety of oils, solutions to lower the freezing point of ice, gums, waxes, varnishes, highly polished films, oiled paper. The grasp of the ice, however, remained firm.

He then tried spreading sheets of raw rubber on the leading edges. No success. Oil was spread over the sheets, but it swelled them, although the grip of the ice was weakened.

Next to be tried was oil-soaked vulcanized rubber, and then oiled rubber vulcanized on fabric. This was better, but still it was difficult for the pilot to knock off the ice.

The rubber overshoe idea was conceived. Tried out in a large wind tunnel at the Goodrich factory here, where freezing fogs were blown by artificial hurricanes against model plane wings, the overshoes worked. The test run today was the practical application.

Catapult Launching for Airplanes

Aëronautical Engineering, February 25.—The development of catapults for the launching of aëroplanes and seaplanes from the decks of ships of His Majesty's Navy dates from 1917 when a Fairey N9 float seaplane was catapulted off an experimental apparatus which had been installed by the Admiralty on a small ship specially built for the purpose and named H.M.S. *Slinger*. But, as a matter of fact, catapulting had been widely discussed in the Royal Naval Air Service before the outbreak of the war in 1914. And the first aëroplane which ever flew, to wit, the Wright in 1903, was catapulted.

The apparatus used in 1917, although successful in launching the first seaplane to be thrown off a ship in actual flight, was necessarily experimental and not suitable for installation on seagoing ships without considerable development and experimentation. At that time the coöperation between the Royal Navy and the Royal Naval Air Service at sea was restricted, by virtue of necessity, to those forms of flying which, even in the experimental stage, could reasonably assure results without extraneous equipment likely to impair the efficiency of surface ships or require the design and construction of aëroplanes embodying specific features normally required for the already allotted tasks of naval aircraft.

Therefore the development of the catapult was postponed in favor of the use of gun-turret platforms from which normal single or two seat landplanes could fly with no other aid than that of the wind caused by the speed of the ship.

After the war, 1914-18, the catapult was revived and development was proceeded with, not only in this country but also abroad.

The United States government, unencum-

bered with the obligations of a full time combatant, immediately proceeded with the development of a suitable catapult and today every battleship and all cruisers of post-war design of the U. S. Navy are equipped with catapults.

Development in Great Britain has been slow insofar as the actual equipment of ships has been concerned, but experimentation has been continuous, not only in the development of a satisfactory catapult but also in the design and construction of aircraft suitable for use therefrom. Catapults are provided for all new light cruisers of the "Washington" classes, completed or building, and several capital ships and cruisers on refitting or reconstruction have been so fitted.

The firm of MacTaggart Scott and Co., Ltd., of the Station Ironworks, Loanhead, Edinburgh, has been responsible for a very large amount of experimental work in the development of catapults for the Royal Navy. Hereafter follows a description of an extending type catapult which has been produced by this company.

This catapult is designed to launch aëroplanes—either landplanes, seaplanes, or flying boats or amphibians—weighing up to 8,000 pounds.

The catapult consists of a girder-like structure which in its fully extended state is 75 ft. 9 ins. long. This is mounted on a turntable to enable it to be trained into the wind. Along the top of the structure is a runway along which is propelled, by a compressed air or an explosive charge, a trolley upon which is supported the aëroplane to be catapulted. The transmission of power from the expansion chamber to the trolley is by ropes passing over a series of pulleys so arranged as to multiply the speed of the trolley to four times the power ram.

The structure on which the aëroplane trolley runs is in three parts, a main central structure and two extending portions. The main central structure consists of two triangulated side frames connected together by a number of cross members which pass right across underneath the frames and project on each side. From the ends of these projections diagonal side bracings are carried up to the top channel, which runs the whole length of the structure and forms a trackway for the trolley.

The center of this structure is mounted on a pivot fixed to the ground or to the deck in the case of a ship. At a distance of 11 ft. 5 ins. on each side of the central pivot are two cross members which are fitted with rollers, one at each end, and these four rollers run on a circular track, 24 ft. in diameter, fixed to the ground or deck.

The weight of the catapult and the vertical reactions are thus carried at the four points of contact on the circular track, and the central pivot only takes the horizontal thrusts. Special grippers screwed up by hand wheels securely lock the catapult in any desired position after it has been trained by a self-locking hand controlled worm gear. The self-locking gear ensures that there is no danger of catapult swinging in a seaway.

The two extending portions, one forward and one aft, are similar and are each one-half of the length of the central structure. These extending portions slide inside the main structure and when extended project 15 ft. beyond its ends. They are constructed of two top and two bottom channels interconnected by vertical and horizontal members. The top channels form a continuation of the runway of the central structure and the bottom channels are machined to slide on gun-metal pads on the central structure when the fore- and aft-portions are extended or withdrawn.

The trolley consists of a rectangular framework of four high-tensile steel angles with a central cross channel running across the rectangle to act as a rope anchorage. Below each corner of the trolley frame are mounted two high-tensile steel wheels, side by side, running on ball bearings, with the outer wheels running on the runway of the central structure and the inner wheels on the runways of the extended structure which, because they telescope into the central structure, are of narrower gauge.

Mounted on the trolley is a superstructure which carries the aëroplane to be catapulted. This superstructure consists of two pairs of legs mounted on cross shafts, one at each end of the trolley frame. The front legs are provided with jaws at the top and separate telescopic oleo struts are carried from the jaws to the rear cross shaft of the trolley. The rear legs are shorter than the front ones and are also fitted with jaws.

The fuselage of the aëroplane is provided with two pairs of trunnions, one on each side at the bottom of the fuselage just behind the lower main planes, in a biplane, and the other

pair further aft just in front of the tail unit.

The forward trunnions sit in the jaws of the front legs of the superstructure and the rear trunnions in the jaws of the rear legs. The thrust is transmitted to the aëroplane from the trolley through the front jaws. The rear jaws only hold the tail of the aëroplane in its correct flying position. The rear legs are telescopic so that the jaws may be raised or lowered and the angle of incidence of the aëroplane adjusted between 0 and 12 degrees to suit the prevailing conditions and the launching speed desired.

To prevent the possibility of the air screw pulling the aëroplane out of the jaws before the launch is made, detents are fitted which are only withdrawn by a series of levers operated by a ramp after the trolley has traveled a certain distance along the runway.

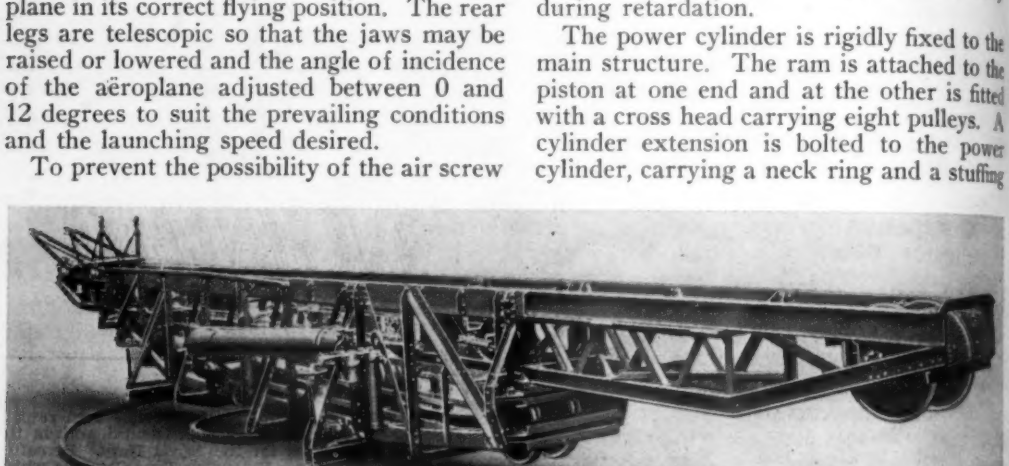
As the accelerating push of the front jaws is greater than the pull of the air screw the aëroplane cannot release itself until the trolley is retarded, even though the detents are withdrawn.

The release gear which withdraws the detents at the same time releases a locking device on the oleo strut supporting the front legs which allows these legs to hinge round their cross shaft and fall down, and so prevent them fouling the tailplane of the aëroplane. The rear legs are also arranged to fall forward on hinges.

Both front and rear jaws are adjustable sideways and the rear legs may be adjusted in a fore-and-aft direction so that a variety of types of aëroplanes may be launched from the same superstructure.

The actuating mechanism consists of a power cylinder in which works a piston and ram. By means of a series of pulleys mounted on roller bearings the ram is connected to the trolley by ropes so that a four-to-one multiplication of the ram speed is obtained and the travel and speed of the trolley are four times the stroke and speed of the ram. Two ropes are used. The accelerating rope transmits the power of the ram to the trolley and the retarding rope transmits the kinetic energy of the trolley during retardation.

The power cylinder is rigidly fixed to the main structure. The ram is attached to the piston at one end and at the other is fitted with a cross head carrying eight pulleys. A cylinder extension is bolted to the power cylinder, carrying a neck ring and a stuffing box for the ram, and provided with a pipe which is connected to a receiving cylinder.



THE MacTAGGART-SCOTT CATAPULT

The piston is provided with a tapered sleeve, equal in length to the retarding stroke of the piston, whose greatest diameter is slightly less than the bore of the neck ring.

The annular space in front of the piston, the cylinder extension, and the pipe to the receiver cylinder are filled with 50-50 mixture of glycerine and water.

When a launch is made, pressure is generated in the explosion chamber, either by the combustion of cordite or by the admission of compressed air, and this pressure drives the piston forward at an ever increasing speed. Meanwhile the fluid in front of the piston is driven through the annulus between the neck ring and the ram into the cylinder extension and through the connecting pipe into the receiver cylinder.

At the end of the accelerating stroke the tapered sleeve enters the neck ring, partially locking up the fluid in front of the piston and so the pressure is raised. This rise checks the speed of the ram, and hence by means of the retarding rope, the speed of the pulley. At this point the aëroplane leaves the trolley.

The following is a brief specification of this catapult:

Length stowed	46 ft.
Length extended	75 ft. 9 ins.
Height from top of channel to base of central pivot	7 ft. 3 ins.
Total weight	19 tons
Accelerating travel of trolley	50 ft. 6 ins.
Retarding travel of trolley	13 ft. 6 ins.
Mean acceleration for 57 m.p.h. launch	2.15 G.
Mean acceleration for 60 m.p.h. launch	2.38 G.
Mean acceleration for 63 m.p.h. launch	2.62 G.
Max. weight of aëroplane for 57 m.p.h launch	8,000 lbs.
Max. weight of aëroplane for 60 m.p.h launch	7,000 lbs.
Max. weight of aëroplane for 63 m.p.h. launch	6,000 lbs.

MISCELLANEOUS

All-Weather Sextant

Herald-Tribune, March 1.—By ROBERT D. POTTER.—"Where am I?" Probably every ship commander, finding himself fog bound or during a storm lasting days, has asked himself this question at one time or another in his career as he stands by the bridge each day, sextant at his side, waiting hopefully for a "shot at the sun."

Even in these days of modern radio communication navigators still place their chief hope of determining their position on their own observations made at sea. This, perhaps, is the natural thing to do, for many millions of dollars in property may hang on their decision. They have more faith in their own calculations than in the thrice removed statements of some wireless operator seated in his radio-room a thousand miles distant on shore.

Baffled in the past by stormy or foggy weather, the navigator has stood helpless in the face of the elements, but now a ray of hope (a true ray in the scientific sense) comes to him; a ray that penetrates the thickest fog and with suitable equipment reacts on the sextant in quite the same way that the visible solar light rays act on the old form of instrument.

The "suitable equipment" has now progressed beyond the experimental stages of its development in the hands of its inventor, P. H. MacNeil, of Huntington, Long Island, and on a recent test on that ocean greyhound, the *Mauretania*, received the enthusiastic approval of the ship's captain, S. G. S. McNeil.

Whereas the ordinary sextant can utilize only the visible portion of the vast "spectrum" of the sun, the new form brings into play the region of invisible rays of the sun on the long wave length side, known in popular language as the heat rays and in scientific terminology as "infra-red" radiation.

Apparatus for detecting the presence of these infra-red rays has long been known to the scientific world in the form of the thermocouple element or a collection of these elements known as a thermopile. Every large university has many such instruments about its physics laboratories.

The physical principle behind the action of the thermocouple is known as the Seebeck effect. When a junction of two dissimilar metals, say copper and iron, or iron and manganine, is heated, an electric current will be generated in the circuit. This current, to be sure, is very minute, but still exists and can be detected by laboratory galvanometers.

The ability of the thermocouple to pick up this heat energy and turn it into electrical energy is a measure of the sensitivity of the apparatus and the smaller the junction the smaller the heat capacity and the greater is the sensitivity. To secure high sensitivity, elements are in common use which are made of tiny wires only five ten-thousandths of an inch in diameter, so small, in fact, that they can be joined into an element only by skilled artisans with the aid of a jeweler's eyepiece.

If the thermoelectric current generated is so small that the measuring devices cannot record it, amplification is necessary, somewhat similar to the amplification necessary in the modern radio set. The problem is more difficult from a technical standpoint, however, for the current is direct current rather than alternating current as in the radio receiver. Until recently the greatest amplification was only about 100 times, which is a ridiculously small figure compared to that obtained in A.C. amplification, but now the research on this problem has secured factors of several hundred thousand times.

Using such a thermopile and an amplification apparatus which he claims magnifies the current 250,000 times, Mr. MacNeil has attached it to an ordinary sextant, and by swinging the arrangement around, both in a vertical as well as a horizontal plane, locates the point in the sky from which the greatest

amount of heat energy originates and falls on the thermopile. This point is naturally the center of the sun, even though it be hidden behind dense fog or clouds. With the angle of this point above the horizon determined, the navigating officer arrives at his position by calculations similar to those necessary with the present sextant.

When the horizon is hidden at sea by fog or on land by obstructions, it is necessary to use either a bubble sextant, or an artificial horizon, both of which eliminate the necessity of viewing the elevation of the sun and the natural horizon at the same time.

This artificial horizon is in common use by surveyors on land where the natural horizon may be obscured by trees, hills, and other obstructions. It consists essentially of a pool of mercury or other good reflecting liquid placed in a shallow dish protected from air currents to prevent ripples in the surface.

By pointing the sextant at this dish of mercury two images are seen, one directly from the sun and the other by reflection from the mercury surface. The angle of the instrument is turned by suitable screws until the two images are superimposed. The angle then read on the instruments is twice the angle of the elevation of the sun. One advantage of the use of the artificial horizon is that the correction for the height of the observer above the horizon may be neglected.

Just why the longer, invisible heat rays are more penetrating than the visible light from the sun is a question that is answered by the physical phenomena of scattering.

Scattering may well be exemplified by the manner in which two types of waves of similar nature physically, but differing in wave length, can penetrate objects, namely: light waves and radio waves. Light waves cannot go through the walls of a house because their wave length is so short that they are scattered by the materials of the walls, while the radio waves, being of much longer wave length, pass through as though nothing were present.

Another very familiar example is the blue color of the sky. Light as it comes from the sun is white light (composed of all colors, which is synonymous with all wave lengths). Upon hitting the outer reaches of the earth's atmosphere the shorter wave lengths are scattered by the molecules of air which are of somewhat the same order of magnitude, while the longer waves pass on as though no air were present. Since the shorter wave lengths of light are what we know as the color blue, we see the sky as formed of this color.

Although the work of eight years of experimentation, Mr. MacNeil predicts further refinements in the construction of the fog sextant, the greatest advance being abandonment of the batteries for the amplifying unit and the substitution of electrical power from the dynamos of the vessel.

The accuracy of the device may be realized by the fact that the true position of the vessel may be calculated to within 20 seconds of latitude, in comparison with a determination of 10 seconds by the ordinary sextant under the most perfect operating conditions. The determination of the position within 20 seconds fixes the exact location of the ship at the center of a circle the radius of which is about one-third of a mile.

NOTES ON INTERNATIONAL AFFAIRS

From March 4 to April 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

FRANCO-ITALIAN NAVAL ACCORD

United States and Japan Consulted.—Prior to the final drafting of the Franco-Italian naval agreement, preliminary conferences were held in London by British, American, and Japanese representatives, the chief purpose of which apparently was to make sure that the terms of the new agreement should not modify or alter the original London treaty in such a way as to necessitate a second ratification of that document. There was also discussion of the conditions under which France was allowed to retain her present quota of 82,000 tons of submarines, and of the significance of the lesser limits of 23,000 tons and 12-inch guns for battleships. Before the middle of March it was announced that all technical details had been agreed upon, and Senator Morrow, who had interrupted a European tour to take part as American representative, left for Sicily. The final drafting was held up, nevertheless, and on March 25 the French delegates returned to Paris for further instructions, after serious disagreement over the terms for replacement of obsolete battleships. Secretary Stimson's radio address on the new agreement, set for March 29, was postponed.

Terms of Agreement.—The text of the preliminary arrangement between France and Italy, as made public by the British Foreign Office on March 11, contained provisions in brief as follows:

(1) Before December 31, 1936, France and Italy may each complete two capital ships of 23,333 tons and not over 12-inch guns, and upon completion of each ship will scrap, in the case of France, one ship of the *Diderot* type, and in the case of Italy an equivalent 16,820 tons of first-class over-age cruisers. The total capital ship tonnage permitted each nation is increased from 175,000 to 181,000 tons.

(2) Each nation may complete 34,000 tons of aircraft carriers.

(3) After completion of the 1930 program, neither nation will build cruisers of over 6.1-inch guns, and of smaller cruisers only sufficient to replace scrapped vessels.

(4) There will be no further submarine construction except for replacement and to complete the 1930 program. France may retain her present submarine strength of 81,989 tons. While considering this figure too high, the British Commonwealth agrees not to have recourse to the "escalator clause" prior to the Arms Conference of 1932.

By the arrangement, construction by each nation will be about equal, but will be reduced to about 22,000 tons a year, as compared with 40,000 tons previously considered. France will retain her total tonnage superiority, but by 1936 this will be largely in older or obsolete ships.

EUROPEAN NATIONS

Austro-German Tariff Union.—Quite unexpectedly after futile efforts to secure economic coöperation under League auspices, and apparently cutting the ground from under M. Briand's schemes for European union under French guidance, came the announcement on March 19 of arrangements for an agreement between Germany and Austria practically sweeping away all trade barriers. According to the terms of the agreement, customs duties on imports to each country would be made the same, tariff receipts would be pooled and distributed proportionately, and the agreement would run for three years, with provision thereafter for abrogation on a year's notice. The agreement it was said was made on the solicitation of Austria and was accepted by Germany to forestall a similar agreement between Austria and Czechoslovakia. Trade envoys of the latter country were in Vienna

and left when the German deal was announced.

This move toward the much-feared *Anschluss* of the Central Powers aroused hot resentment in France and perturbation among the Balkan nations. It was at once questioned whether the pact was not contrary to the Treaty of St. Germain, Sec. III, Art. 88 of which requires Austria "to refrain from any act which might directly or indirectly or by any means whatever compromise her independence," and contrary also to the terms of the Geneva protocol of October, 1922, providing for Austria's economic rehabilitation. A crisis was avoided by Foreign Minister Henderson's suggestion to Germany and Austria, after consultation with M. Briand, that they should take no further steps until the League Council had passed upon the legality of the plan. To this the two powers consented, though Foreign Minister Curtius of Germany declared in a speech before the Reichsrat on March 31 that the question of legality had already been carefully considered. He hoped the pan-European preparatory commission would also examine it in their next session on May 15. Curtius is himself due to preside at the League Council meeting on May 18.

Governmental Loans.—Completion of preliminary arrangements for a French loan to Rumania of $26,000,000, to be issued at 81 with 7.5 per cent interest, was announced in the Paris press of March 5. Similiar French loans to Poland and Jugoslavia are under consideration, and Greece is reported to be seeking a credit of $40,000,000 to be placed half in Paris and half in London. The success of the Franco-Italian naval agreement has increased also the prospects of favorable French action on a loan in the neighborhood of $100,000,000 which Italy has for some time been seeking abroad.

Spain likewise during March secured a foreign loan of $60,000,000, the advancement of this credit affording some evidence of continued foreign faith in King Alfonso's ability to maintain himself in power. The American share in this loan is reported to be $38,000,000. The money is to be used chiefly in an effort to stabilize the peseta, the decline in the value of which has been a considerable factor in Spain's recent political agitation.

Sixth Soviet Congress.—The most notable feature of the sixth session of the All-Union Soviet Congress which convened at Moscow on March 8 was the opening speech of the new President of the Council of People's Commissars (or Premier) Vyacheslaf Molotoff. Against charges of dumping abroad M. Molotoff declared that Russia's share in the world export trade was only $500,000,000 in 1930 as compared with $750,000,000 in 1913. He declared Russian labor was "disciplined" but not "forced," and warned America against trade barriers to keep out Soviet goods, lest Russia should make her purchases elsewhere. Later in the sessions of the Congress the two deposed Right leaders Rykoff and Bucharin were returned to places in the Central Executive Committee, and Rykoff was made Minister of Posts and Telegraphs, an evidence of increased solidarity in Communist party councils.

U. S. State Department to Study Russia.—Announcement was made on March 8 that Secretary of State Stimson had arranged for more detailed study of Russian problems, especially in view of the multitude of questions that have recently arisen relating to Russo-American trade and Communist activities in America. The move was not taken as a step toward American recognition, and in fact an order was shortly afterward issued restricting the use of passports by Americans wishing to enter Russia. The increased study may be taken rather as a timely recognition of the fact that the Russian Communist experiment, whatever its outcome, is certain to be an important factor in world relations during the next few decades.

Adjournment of German Reichstag.—On March 26 the German Reichstag adjourned till October 16, leaving the Bruening cabinet with full parliamentary sanction to carry out its policies in the meantime with dictatorial powers. The action of the Hitlerite deputies in walking out of the Reichstag in February, while intended as a move to force the cabinet out of office, had the effect rather of a stupid blunder which discredited the whole Nationalist movement and strengthened the alliance between the government and the dominant Socialist party. The 1931 budget of $2,540,000,000 was

put through without opposition, including the initial appropriation for a second cruiser of the *Ersatz Preussen* type.

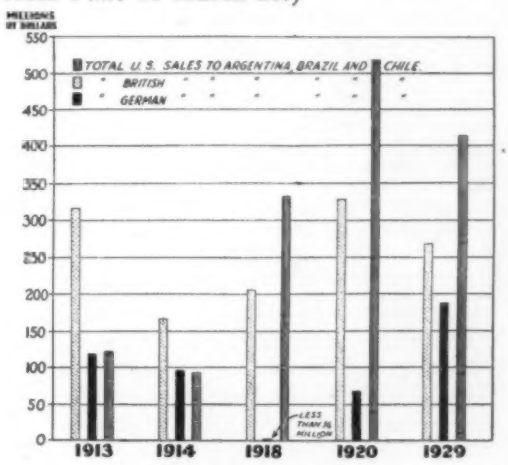
NORTH AND SOUTH AMERICA

FURTHER UPSETS IN PERU.—During March the political situation in Peru was marked by further upheavals, demonstrating, according to some interpretations, a state of complete governmental chaos, and according to others a persistent purpose of the Peruvian people to get away from dictatorial rule. Scarcely had the Cerro government been replaced by an Army-Navy junta headed by Chief Justice Ricardo Elias, when on March 5 a body of troops returning from the south under Lieutenant Colonel Jiminez marched into Lima, quickly seized the government house and other strategic points, and forced the Elias junta out of power. Negotiations were then opened with the southern leaders at Arequipa, and it was finally arranged that a new government should be set up with a cabinet representative of both Army and Navy and all sections of the country, with Colonel Samanaz Ocampa, head of the Arequipa faction, as provisional president and Colonel Jiminez as minister of war. As soon as possible elections were to be held, in which no member of the present government was to appear as a candidate.

Although this arrangement was apparently accepted by all factions, the country was not allowed to settle down without another bloody uprising, when on March 24 the troops chiefly of the Fifth Regiment revolted against their officers but were finally driven back into their barracks and disarmed after a loss of about 200 lives. This regiment had figured conspicuously in previous upsets and had seemingly come to consider revolutions a matter of routine.

PRESIDENT HOOVER IN THE CARIBBEAN.—President Hoover's one-week vacation cruise in the U.S.S. *Arizona* to Porto Rico and the Virgin Islands, beginning March 18, had little political significance save in drawing attention to the progress in self-government made in Porto Rico despite adverse economic conditions, and on the other hand the complete impoverishment of the Virgin Islands, where from a variety of causes—the ruin of the rum industry by prohibition, the decline of sugar prices, the decreased importance of St. Thomas as a coaling station, and the withdrawal of naval forces—poverty has steadily increased under American rule. During his five-hour stay at St. Thomas, the President was entertained by Governor Pearson, recent civilian appointee to take over from the Navy one of our most difficult minor problems in colonial administration.

BRITISH PRINCES IN SOUTH AMERICA.—The commercial mission to South America of the Prince of Wales and his youngest brother Prince George reached its culmination with the opening in March of the $20,000,000 British Empire Trade Exposition at Buenos Ayres. Coming to the Argentine capital on March 5 after highly successful visits to the republics of the West Coast, the Princes left on the twenty-first by airplane for Montevideo, where they planned to remain some time before continuing to Brazil. The Trade Exposition was described in the press as a most creditable display of British, Canadian, and other empire products, designed toward recovery of the Argentine and South American trade that has passed into the hands of the United States and also in increasing measure to Germany since the war. (See diagram taken from *Time* of March 23.)



From *Time*, March 23

CANADIAN PROTEST ON "JOSEPHINE K."—The Canadian Government on March 17 sent a note of protest at the shelling and seizure of the rum-running schooner *Josephine K* off the Jersey coast on January 25,

and the killing of her captain, William P. Cluett, Lunenberg, N.S., by a shot fired from Coast Guard-*145*. The Canadian contention, as in the *I'm Alone* case of March 22, 1929, still under arbitration, is that the schooner when attacked was not within an hour's steaming or sailing distance of the coast, and that there was an unjustifiable use of force in effecting her capture.

THE PROBLEM OF INDIA

GANDHI VOTED FULL POWERS.—Following the truce negotiated by Mahatma Gandhi and the Indian Viceroy Lord Irwin early in March, the Mahatma called a meeting of the All-India Nationalist Congress, and in its session at Karacha during the last week of March demonstrated his complete control of the party by securing the passage of a series of resolutions giving him practically a free hand as head of the Nationalist delegation in prospective round table discussions. Though it was stipulated that the goal of *purna swaraj* (complete independence) should remain intact, and that the delegation should work "to give the nation control over the Army, external affairs, and finance," there was the saving clause that "the delegates will be free to accept such adjustments as may demonstrably be necessary."

At a preliminary conference on March 21 between the Viceroy, Gandhi, and other Indian leaders it was tentatively arranged that the first part of the second round table negotiations should be held at Simla and the final session at London next September, with immediate work by committees on the federal organization, the separation of the Northwest Frontier Province, and other problems of the new constitution.

BRITISH-INDIAN TRUCE.—The action of the Nationalist Congress in approving further negotiations with England was preceded by the arrangement of a truce between Gandhi and the Viceroy, the terms of which, as published on March 5, provided for the cessation of the civil disobedience campaign and the boycott of English goods, though the campaign against foreign clothing and intoxicants might be continued by peaceful methods. The government agreed in return to repeal special measures against civil disobedience, release political prisoners not guilty of violence, return seized property and remit fines, and permit local inhabitants to make salt for local consumption and sale. This truce was subsequently ratified by the Congress despite opposition from the extremists, who showed signs of getting beyond Gandhi's control.

FAR EAST

PROPOSES JAPAN TAKE PHILIPPINES.—A logical though unexpected solution of the problem of Philippine independence was presented by the noted historian Herbert Adams Gibbon of Princeton when in an address at Manila on March 25 he declared that a Japanese mandate over the islands was the only alternative to continued American rule. Referring first to his past sympathy with nationalistic movements he declared the Philippine movement for independence unique in that, "it is not based upon any grievance and its leaders have absolutely no provision for the future after they achieve their aspirations." The following extracts are from the New York *Times:*

> There is no abuse of power arbitrarily exercised by foreigners. They are not eaten out of house and home by a host of foreign functionaries. They have no army of foreigners quartered upon them whom they are forced to support. There are none of the conditions in the Philippine Islands comparable to those which caused Patrick Henry to cry "Give me liberty or give me death."
>
> The Filipinos have liberty, quite as much liberty as, if not more than, the people of the United States. Liberty is an inherent right, independence is merely a technical term in international law.
>
> Immediate independence is what I hear on every side. It is put into political platforms. It is the cry of electoral candidates. And yet no sensible Filipino can possibly believe that the United States would or could grant immediate independence to these islands. The American Congress would never dream of letting down the American business enterprises established in these islands, comparatively modest in importance as they are.
>
> If independence were to be granted it could be only after a sufficient term of years had elapsed, with due warning given so that these interests of ours could liquidate in an equitable way. Moreover, the American people would be loath to cut the Filipinos adrift suddenly, for the sake of the Filipinos themselves. If the Filipinos do not know what it would mean to them to have American markets cut off overnight by the automatic application of the American tariff to their exports, we do. In saying flatly "No" to the immediate independence cry, which I do not hesitate to call claptrap, we are better friends to the Filipinos than they are to themselves.
>
> And now we come to complete independence, or absolute independence, as some call it. Under existing conditions in the islands in Eastern Asia and

in the world at large, this desideratum is as much of a will-o'-the-wisp as immediate independence. We wish it were not. I am wholly sincere in saying this. I think the American people would like to give the Filipinos complete independence. . . .

For a long time to come, both for their defense and for their economic well-being, the Filipinos will have to be content without immediate or complete independence. When we travel through their marvelous country, whose people are so friendly and hospitable, we wonder why they want to get rid of us. Is it true that they feel we have done them no good, that we have wronged them, that they would be better off today had they never seen an American in these islands?

Well, it is not what is but what one thinks that matters. If the Filipinos think that our thirty-odd years here are in vain and have been destructive rather than constructive, we certainly don't want to remain another thirty. Our work is finished and we should recognize that fact. We are not Asiatics. Have we failed for the reason that only an Asiatic power would know how to treat the Filipinos well?

Japan is the logical successor of the United States as mentor of the Filipinos. Japan could develop these islands better than we have done. Japan would be more enthusiastically received, I have no doubt, than we have been. If the Filipinos want to get rid of the Americans, the Japanese succession is the only alternative I see. It would be impossible for the Filipinos to maintain complete independence against Japan. Let us talk facts. We all know that to be true.

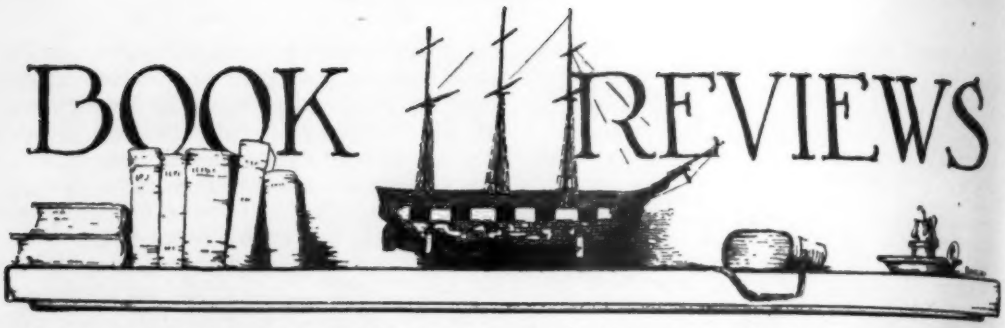
Would it not be good policy, then, in view of the Filipino attitude toward us, for the United States to negotiate with the League of Nations for the appointment of Japan as mandatory of the League for these islands? A war over the Philippine succession would be thus avoided. We should be gracefully free of our unwilling wards. And Japan would round out her mandated area in this part of the world and have a new field for much needed expansion.

No Progress on Extraterritoriality.—Negotiations between China and Japan on the extraterritoriality issue taken up at the close of March were brought quickly to a halt when China declined to consider gradual relinquishment as a basis for discussion and insisted on immediate abolition of unequal treaties. In this respect it is unlikely that France and the United States will make further concessions than has Japan. Similar negotiations undertaken by the British Minister Sir Miles Lampson were broken off for the same reason, though it was reported that the British were ready to adopt a more yielding attitude and to surrender special privileges except at Shanghai.

Anti-Banditry Operations.—Conflicting reports came in during March as to the success of the government operations against banditry in China, especially in the provinces of Hupeh, Hunan, and Kiangsi. Orders were issued for energetic measures to bring brigandage under control before the opening of the People's Conference originally set for May 15, but such results were to say the least unlikely in view of the activities of some 200,000 Communist forces in Kiangsi alone and 100,000 more in Hupeh. By April 1 the Peiping-Hankow Railway, which had been blocked by the Communists, was reported again "spasmodically" operating.

Conditions along the Yangtze were reported by Hallett Abend, in the New York *Times* of March 11, as follows:

> The chaotic, lawless conditions on the Yangtze River from Hankow to Ichang are so bad that commerce would have had to come to a standstill months ago except for the continuous patrolling and attacks by foreign gunboats. In these activities the Japanese and British lead both in the number of warcraft and in aggressive policy. America is third, with fewer ships and a restrained policy.
>
> The British and Japanese are absolutely ruthless in firing upon Communists and bandits along the shore, the Japanese particularly firing rifles, machine guns, and big guns whenever a Red flag or suspicious activities are evident. As a result, shore firings upon Japanese merchant ships are becoming more and more rare.
>
> The American gunboats, numbering five in active commission, follow a policy of firing only when fired upon and then carefully restrict their fire to the assailants. Nevertheless, in the last seven months American gunboats were fired upon more than thirty times. American merchant ships with armed sailor squads were fired upon more than sixty times and American merchant ships without guards about a dozen times.
>
> These figures are about double those of the preceding twelve months. Foreign naval authorities agree that disorder and attacks on foreign vessels are more widespread and more intense than in 1927, which heretofore was the worst period.
>
> A disturbing factor in the situation is that Chinese gunboats, though plentiful and occasionally firing upon the Reds, are not of much service because they usually appear after the foreign gunboats have cleared the banks and almost always go downstream at full speed when trouble develops.
>
> The only reassuring feature in the situation is the fact that Nanking is not objecting to the activities of the foreign navies on the Yangtze River while the civilian authorities of Yangtze towns are extremely cordial to the foreign gunboats, most classes of the Chinese population praising this foreign intervention in a situation which without foreign gunboats would rapidly become chaotic.



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THE BYNG PAPERS, Volume I. Edited by Brian Tunstall. Printed for the Navy Records Society, London: Clowes & Sons, 1930.

REVIEWED BY LIEUTENANT COMMANDER FORREST SHERMAN, U. S. NAVY

The Navy Records Society has made available in this interesting first volume an authoritative biographical sketch of Admiral Sir George Byng (1663-1733), first Viscount Torrington, together with introductory summaries of the various sections of his papers, letters, and journals. These papers, together with those of his son, Admiral John Byng, were placed at the disposal of the editor by the present Earl of Stafford, the great-great-great-great nephew of the latter admiral.

The first volume covers the life of Sir George Byng up to the year 1707. A future volume or volumes will cover the remainder of his career and also the life and papers of Admiral John Byng, who was found guilty of neglect of duty by a court-martial and shot on the quarter deck of the *Monarque* on March 14, 1757.

Sir George Byng had a very remarkable and successful career, rising through the various grades in the British Navy to be admiral of the fleet, rear admiral of Great Britain, and first lord of the admiralty. As a young officer he had the unique experience of serving both in the Army and the Navy. It seems that in 1681, being then eighteen years old, he arrived in Tangier, which was then governed by one Colonel Percy Kirke. Kirke, who is known to posterity chiefly for his notorious severity after the Monmouth rebellion, took a fancy to young Byng and after inquiring "what he did with that ill-tempered captain," commissioned him as an ensign in his own regiment. By 1683 he was a lieutenant in the Army and was then returned to the sea service as first lieutenant of the Tangier station ship. At the end of the year he returned to regular sea service with leave of absence from the Army. He continued to enjoy the perquisites of military rank for eight years.

After serving in the East Indies, Byng, as first lieutenant of the *Defiance* took a prominent part in the intrigues leading to the inactivity of the King's fleet during the landing of William and Mary in 1688. For his efforts he received command of a fourth rate and a military promotion in the Earl of Oxford's guards. He commanded the *Hope* in the Battle of Beachy Head, 1690; held other commands afloat; and in 1703 was promoted to rear admiral of the red and was sent to the Mediterranean as second in command. In the following year he was second in command under Sir George Rooke. He was in immediate command of the detachment which bombarded Gibraltar while English and Dutch marines were landed in the present neutral ground and took the "rock." Later in the year he commanded the British center at the Battle of Malaga. For his behavior on these occasions he was knighted.

The year 1705 found Byng a vice admiral commanding a squadron defending commerce in the Channel. In 1706 he sailed with fourteen of the line to join Sir John Leake and arrived in time to effect the relief of Barcelona which had been beleaguered by a French Army and fleet. He commanded the British squadron at the bombardment and capture of Alicante in July, 1706.

He took a prominent part in the siege of Toulon in 1707. Toulon was a most vital point. "From Toulon the French could send troops by sea to Spain, to Italy, and to Egypt, and by land to Spain and Italy along the coast roads, while using it for purely naval purposes. They could protect their own commerce, interrupt every one else's and completely dominate the Western Mediterranean." The Duke of Marlborough determined on its capture by combined operations of the Anglo-Dutch fleet, the troops of Prince Eugene and the army of the Duke of Savoy. History is full of failures in combined operations. It is not surprising that, with four nations involved, lack of "coöperation was a cause of failure." Byng attended the attacking army during its approach along the coast, supported its passage of the river Var with the guns of his squadron, took Hieres with a naval landing force, and held it until after the allied army had returned to Nice. *The Byng Papers* contains an interesting description of the successful use of indirect fire by bomb vessels against shipping in the basin of Toulon. "They could not see the ships, but were guided over it by a flag placed on the top of the hill by our people." After the collapse of the Toulon campaign most of the British fleet returned home. The *Association*, carrying Sir Clowdisley Shovell, the commander in chief, was lost off the Scilly Isles, leaving Byng the second senior officer on the active list.

In 1708, as admiral of the blue, he drove off a French fleet attempting to invade Scotland in behalf of the ex-king, James, and continued on similar duties until 1717. In 1718 he was promoted to admiral of the fleet and sent to command in the Mediterranean. On July 31, 1718, he won the extraordinarily complete victory of Passaro in which with twenty-one sail he utterly destroyed eighteen Spanish ships of the line accompanied by light vessels. In the words of Corbett "the English might be rather said to have made a seizure than to have gotten a victory."

After two more years afloat Byng was raised to the peerage, made a knight of the Bath and on the accession of George II was made first lord of the admiralty, which office he held until his death. His outstanding achievement was no doubt the Battle of Passaro. However, one cannot help being impressed with his long record of successes as a squadron commander engaged in difficult coastal operations in coöperation with the Army. Commencing with the responsibility for the embarkation after the Vigo Bay operations in 1702, Byng was unusually successful in such activities throughout his career.

The letters are full of interesting and sometimes amusing sidelights on conditions of the times. An order from Sir Clowdisley Shovell prescribes "that three women be allowed to go along with each company of marines, which shall be put on board the fleet." Again Sir Clowdisley orders an increase from six to seven pints of wine per man per week "to the end the seamen may have all one encouragement."

Apparently the command of hospital ships, which has given cause for argument in modern times, was in dispute even in 1703 for we find the commander in chief writing to the rear admiral, "Sir: Captain Bumsted, commander of the Syam hospital ship has often complained to me of the insolence and misbehavior of his surgeon, which I passed over expecting the surgeon would grow better, but it seems he grows worse, and Captain Bumsted tells me now that the surgeon had the impudence to strike him last night, which is an insolence beyond bearing. . . ."

PREPARING FOR AVIATION. By Lieutenant Volney C. Finch, U. S. Navy (Retired). New York: The Simmons Boardman Publishing Company. 1931. $4.00.

REVIEWED BY LIEUTENANT COMMANDER D. C. RAMSEY, U. S. NAVY

The author of this book, Lieutenant Volney C. Finch, U. S. Navy (Retired), has set out with the expressed aim of presenting a treatise on aviation which is neither highly technical nor elementary. It falls, therefore, in an intermediate category and should serve a most useful purpose in meeting the needs of schools and junior colleges where aviation groundwork is presented. The text deals solely with heavier-than-air craft.

Lieutenant Finch has had long and varied experience in naval aviation as an active flyer. This experience combined with his technical training as a postgraduate student, subsequent qualification as master of science in aëronautical engineering, and appointment to the professorship of aëronautical engi-

neering at the Alabama Polytechnic Institute, lends prestige to a work which, in any case, cannot fail to hold the attention and interest of both the technical and non-technical reader.

While *Preparing for Aviation* is fundamentally a material treatise it includes historical notes and data so interwoven with the text as to bridge the gap between early and present aviation developments and to leave in the reader's mind a clearly defined picture of the evolutionary processes which have brought the art of aviation to its present degree of perfection.

Beginning with a discourse on aircraft nomenclature and aircraft types in the opening chapter, the author presents in well arranged order the various elements which enter into the plane structure, the details of treatment which make them suitable for aviation purposes and the final processes which unite them in the finished product.

Three chapters are devoted to airplane engines which include details of construction and performance of the best known and most modern types. Separate chapters in the latter part of the book deal with gliders and the autogyro. It is appropriate that the author should discuss the actual operations of these types of aircraft which have not as yet found the established place in aëronautics occupied by the airplane.

A convenient reference will be available to the aviation student who desires to qualify as a flyer in the information set forth under the chapter "How to Become a Pilot." In this part of the book the various forms of licenses issued by the Bureau of Aëronautics of the Department of Commerce are described, certain psychological elements which are essential in the qualifications of the successful pilot are discussed, and a summary is given of the various phases of training which must be completed before the student aviator can embark on a flying career, either for sport or commercial purposes.

There is one minor discrepancy in Lieutenant Finch's work which will not escape the attention of students of U. S. naval aviation history. He states in his discourse on the historical development of the airplane that catapults were placed on battleships in the year 1916. As a matter of fact the first United States battleship to be equipped with a catapult was the U.S.S. *Maryland*. The installation was not completed until 1922. It is true, however, that the U.S.S. *North Carolina* was fitted with an air catapult and launchings made as early as 1916 from that vessel. It is true, likewise, that early shipboard catapult experiments were conducted by the British but there is no record to refute the claim that the U. S. Navy was the world leader in the development of catapult operations from capital ships.

One feature of Lieutenant Finch's book, particularly deserving of mention, is his scheme of supplementing each chapter with a list of references which can be consulted by those readers who desire additional or more detailed information on the subject matter covered by each section.

The concluding chapter contains a list of Department of Commerce aviation examination questions which will be helpful to the student in testing out his general knowledge of the subject.

Not the least interesting feature of *Preparing for Aviation* is the collection of photographs and sketches. The views of planes are particularly good and all types of commercial aircraft from the light sport model to the multi-engined land- and sea-planes are included.

It is apparent that Lieutenant Finch's work has been thoughtfully planned. It is well balanced, up to date, and deserving of the most careful attention of aviation students.

MODERN DIESEL ENGINE PRACTICE. By Orville Adams. New York: The Norman W. Henley Publishing Company. 1931. $6.00.

Reviewed by Commander W. R. Carter, U. S. Navy.

The book is an excellent one which should be available to every operating engineer. It is a book which all operating naval engineers might read with profit whether they be engaged in operating steam or oil engines. The book is written in a simple, clear manner and is not filled with complex or intricate details and yet covers the whole subject in a general way which would be valuable, both to the engineer who has never operated Diesels and to the engineer who is at that time operating Diesels.

There is much within the book to furnish comparative operative methods and points on which to refresh the memory. The chap

ters VI, VII, VIII, IX, X, XII, XIII, and XIV are particularly good reading for all operating engineers, Diesel or steam engineers, who wish to acquire some general information.

The two chapters XVI and XVII on the "Packard-Diesel Aircraft Engines" are excellent and the illustrations are particularly good.

In Chapter XII, "The Instructions for Installing and Operating Pyrometers on Diesels" is particularly recommended to the submarine Diesel engineers of the Navy as is also the entire Chapter XIV on "Piston Ring Relation to Efficient Lubrication and Economy of Operation."

The last four chapters of the book, while not bearing directly upon naval work are, nevertheless, very interesting to any engineer and might well furnish the naval engineer a point of view from which to draw up a new naval application.

The book should be in the reference library of all operating engineers.

SECRET SERVICE. By Sir George Aston, K.C.B. New York: Cosmopolitan Book Corporation. 1930. $4.00.

REVIEWED BY LIEUTENANT COMMANDER H. K. FENN, U. S. NAVY.

Those inclined to be intrigued by the title may look in vain through shelves of thrillers and fail to find a book more amusing and interesting in its detail, or as instructive in its broader aspects. The theme and purpose of the book is obviously of the broader aspects, but scattered stories of secret agents, of whom we have already heard, are utilized to illustrate points or to support theories or contentions.

Many good lessons are taught, and the functions and methods of intelligence organizations are clearly and forcefully explained. Better than that, the growth of British intelligence is more or less closely followed from its beginning.

The importance of intelligence to higher command is by no means minimized, but one learns that when victory follows good intelligence work, it is not the intelligence work that is solely responsible for the victory, but rather the attainment of good organization. For an organization good enough to keep its own secrets and learn those of the enemy, is good enough to achieve victory.

There is a refreshing absence of the alien felon who stalks about with false whiskers and burning eyes under lowered brim.

It is a fascinating work of a scholarly gentleman with a lifetime of wide, important, and interesting experience. In scarcely any service of today would it be possible for a young shavetail marine to be jerked out of an innocuous berth in the fleet and launched upon a life's career that would eventually connect him intimately with the Army, Navy, Marine Corps, staff colleges, and war council. The intense professional interest and industry that made such a thing possible to Sir George Aston is reflected in the pages of his book.

NUMERICAL MATHEMATICAL ANALYSIS. By James B. Scarborough, Ph.D. Baltimore: The Johns Hopkins Press. 1930. $5.50.

REVIEWED BY ASSOCIATE PROFESSOR C. H. RAWLINS.

Professor Scarborough, in the preface of his book, explains its purpose as follows:

"Applied mathematics comes down ultimately to numerical results, and the student of any branch of applied mathematics will do well to supplement his usual mathematical equipment with a definite knowledge of the numerical side of mathematical analysis. He should, in particular, be able to estimate the reliability of any numerical result he may arrive at. The object of this book is to set forth in a systematic manner and as clearly as possible the most important principles, methods, and processes used for obtaining numerical results; and also methods and means for estimating the accuracy of such results."

Not content with the standard formalities of the preface, the author, at the beginning of the first chapter, humanizes the volume by this comment on the teaching of grammar-school arithmetic:

"The result of such teaching is that the student gets into the habit of making all computations as long as possible, or else, if the labor seems too great, cuts down some of the numbers to two or three figures and then gives his result to as many figures as possible. This habit usually stays with him throughout life and frequently causes him to get six-figure results from three-figure data."

How very true! Many a person is likely

to report the circumference of a circle, twelve feet in diameter, to be 37.6992 feet, no more, no less, or to give a nice exhibition of useless arithmetic if asked to find, without use of slide rule or tables, the period of a simple pendulum 32.7 inches long. Many an engineer deals with heavy bodies and calculates their weights down to the last tenth or hundredth of a pound. So the reader, conscious of possessing such infirmities, will derive from this chapter,—on "The Accuracy of Approximate Calculations,"—an urge to mend his ways,—and to lead others to mend theirs.

This chapter is followed by five on the process of interpolation (including double interpolation) and the accuracy of the standard interpolation formulas, two on methods of numerical differentiation and integration and the accuracy thereof, two on solution of numerical algebraic and transcendental equations (single equations with one unknown, simultaneous with several unknowns), three on the numerical solution of differential equations including accuracy of the solutions, three on the method of least squares and related topics, and a final (seventeenth) chapter on harmonic analysis of empirical functions.

The author explains in his preface that "the treatment of all topics has been made as elementary as was consistent with soundness" and that "the book is meant to be understood with a minimum of effort on the part of the reader." One is thoroughly impressed with the general excellence of the book in these respects. The topics are presented, explained and illustrated with remarkable clearness and painstaking thoroughness. All of the standard methods are given together with some which are not so well known; and their proper use is shown by page upon page of numerical work. One marvels at the time and effort which the author must have spent in the preparation of these illustrative examples. Each chapter ends with a list of unsolved examples to test the reader's skill.

Probably no one has ever succeeded in presenting least square theory in a manner satisfactory, at first reading, to the uninitiated. Hence it is to be expected that this part of the book should seem to lack the clarity of the other parts, for the reader may need time for the absorption of some new ideas.

One is confronted with few opportunities for adverse comment. However, the reader probably needs to be told, in still plainer English, on pp. 40 and 41, that a horizontal difference table is merely a diagonal difference table with its horizon changed and that there is no fundamental need for change of notation. Also, some mathematicians may be inclined to argue about certain mathematical niceties in chap. XIV (on least squares). Nevertheless, the results given are the standard ones and the use of them is illustrated correctly.

Many readers are probably not familiar with the following facts and will enjoy discovering them in this book:

1. There exists a simple method for detecting and correcting errors in most of our tables.

2. The trapezoidal rule and Simpson's and Weddle's rules (for numerical integration) are all special cases of a standard formula.

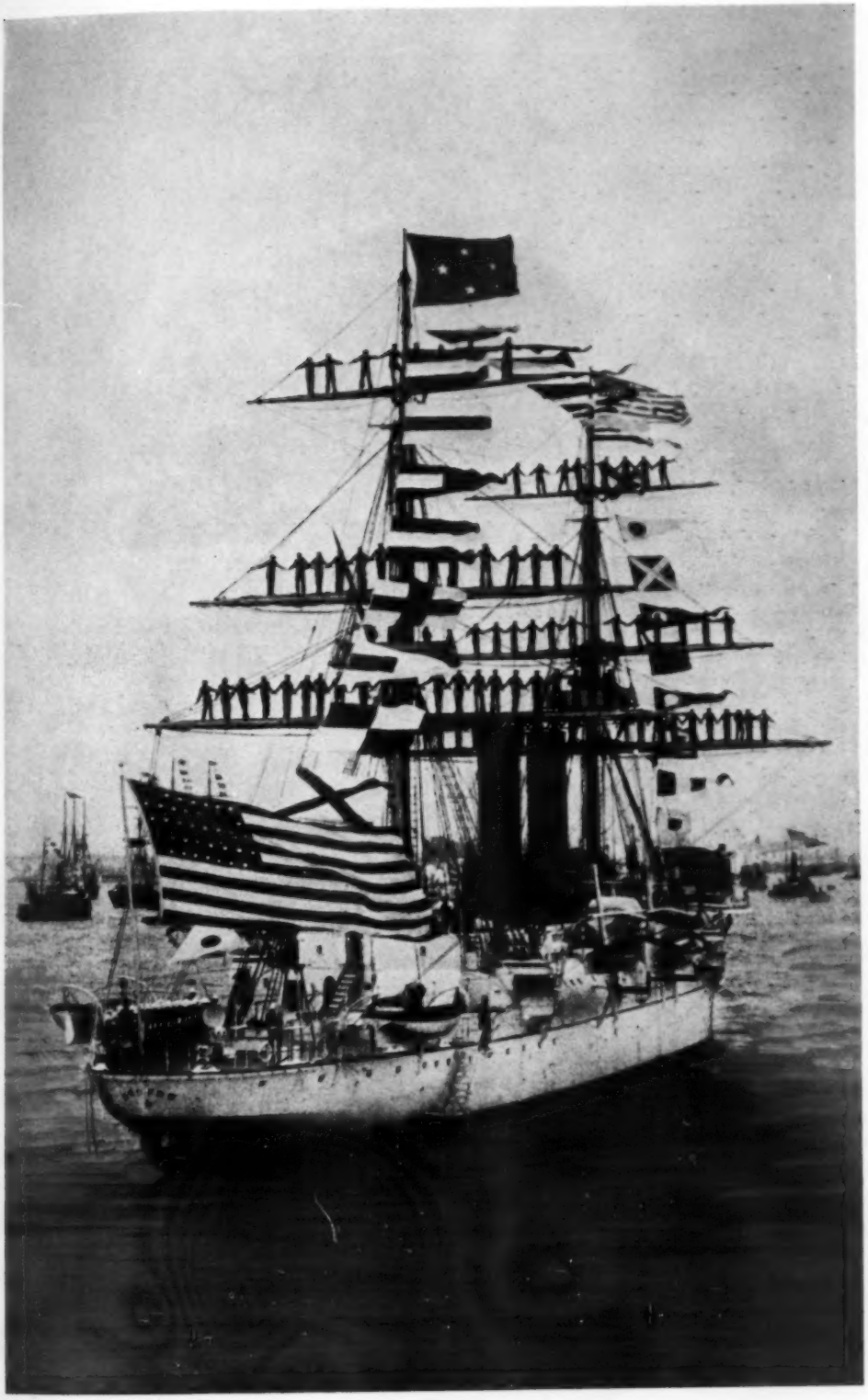
3. Whoever wishes to compute a mean daily temperature should not take his thermometer readings punctually "every hour on the hour" but should give them a certain irregular spacing.

4. The analytic solution of a differential equation may be more cumbersome for the obtaining of numerical results than the solution by numerical methods.

The author presents, almost entirely, the work of other mathematicians,—in readable form and with familiar mathematical notation. He does include, however, some previously published work of his own on the relative accuracy of Simpson's rules, and also on a method for computing certain probable errors.

The book is of pleasing physical appearance. The type is satisfactorily large and the pages have a good general layout. There is almost a complete absence of footnotes and fine print. The set-up is such that the main facts and formulas are easily singled out. Apparently the misprints are few and harmless.

We believe that the book has the proper scope and that the technical student, young or old, in school or out, should have at least a speaking acquaintance with all its parts. He will probably need to know some of them intimately. Hence we heartily commend the book to him.



Courtesy Naval Academy Museum

MANNING THE YARDS, U.S.S. *BOSTON*, CENTENNIAL OF WASHINGTON'S INAUGURATION, NEW YORK, APRIL 29, 1889

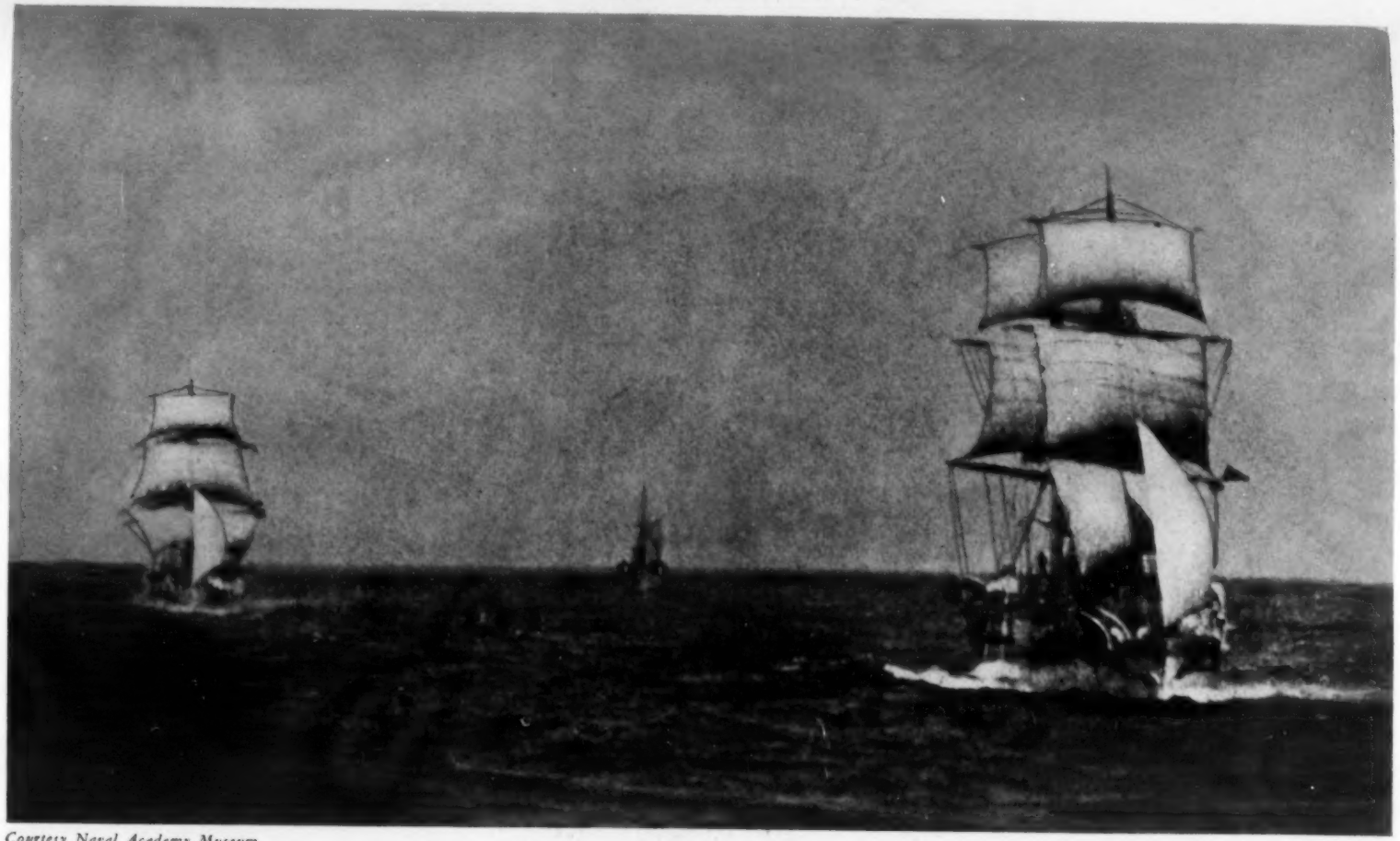
This shows another custom of the wood-and-sail era carried over into the era of steel and steam.

From original presented to the Naval Academy by Rear Admiral W. W. Phelps, U. S. Navy

SPANISH CRUISER *REINA MERCEDES* SUNK IN SANTIAGO HARBOR, 1898

From original presented to the Naval Academy by Rear Admiral W. W. Phelps, U. S. Navy

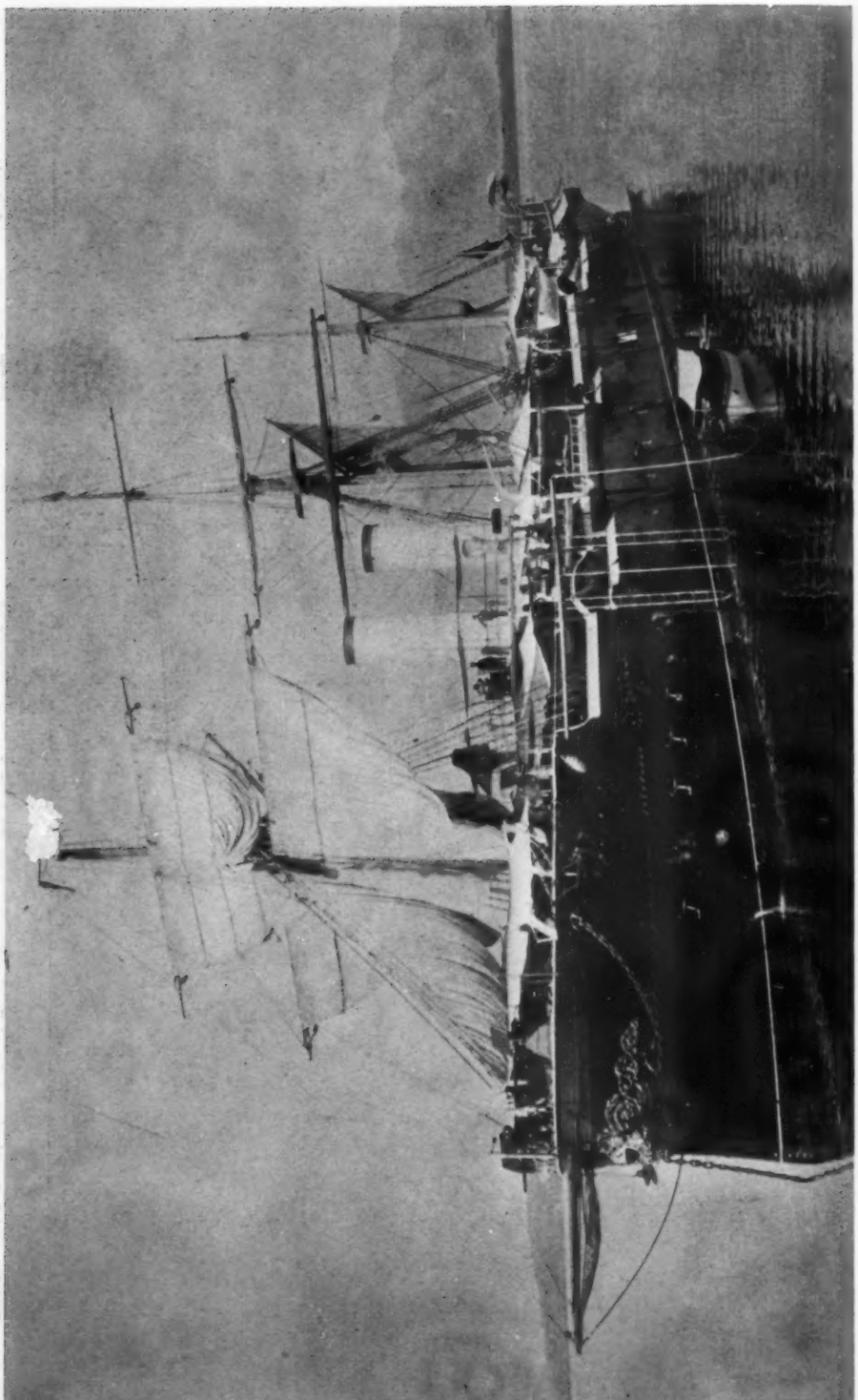
SPANISH CRUISER *REINA MERCEDES* SUNK IN SANTIAGO HARBOR, 1898



Courtesy Naval Academy Museum

THE WHITE SQUADRON AS SEEN FROM THE BRIDGE OF THE FLAGSHIP *CHICAGO*, REAR ADMIRAL JOHN G. WALKER, U. S. NAVY

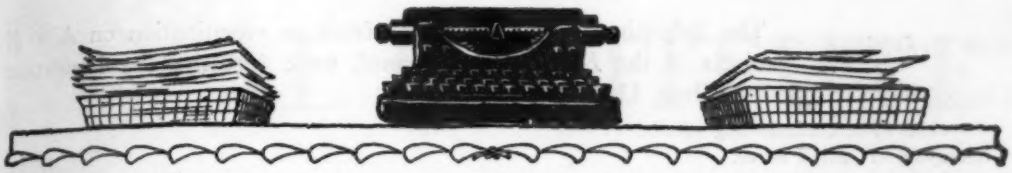
Cruisers of the steel-and-steam age decked out as in the age of wood and sail, a quarter of a century after the Civil War had supposedly stripped the rigging from men-of-war.



From an original presented to the Naval Academy by Rear Admiral W. W. Phelps, U. S. Navy, who commanded U.S.S. "Reina Mercedes," 1913-15.

THE *REINA MERCEDES*, AS A SPANISH CRUISER
She is full rigged as in the days of wood and sail.

SECRETARY'S NOTES



The "Reina Mercedes"—A hybrid of sail and steam Station Ship at U. S. Naval Academy

The *Reina Mercedes*, a full-rigged Spanish cruiser, was built at Cartagena in 1887 and was named after Queen Mercedes of Spain. In the Spanish-American War she was the station ship at Santiago, Cuba. When Lieutenant Hobson took the *Merrimac* into the entrance of the harbor to block the channel, the *Reina Mercedes* gave him a broadside from her small guns and also fired two torpedoes, but without damage to the Americans. On the surrender of Hobson to Admiral Cervera, he and his men were temporarily quartered aboard the *Reina Mercedes*. During the subsequent bombardments of the Santiago forts, especially on June 6, 1898, the *Reina Mercedes* was frequently struck and was twice set on fire. After the battle of Santiago, July 3, 1898, the Spaniards attempted to use her to block the entrance to the harbor, but she was sunk by the *Massachusetts* and the *Texas* before she succeeded in this attempt. With the fall of Santiago, the *Reina Mercedes* became a prize of the war. She was later raised and repaired. On September 30, 1912, she arrived at the Naval Academy to replace the *Hartford* as station ship. In her early days here Rear Admiral W. W. Phelps, the donor of the photographs reproduced in the preceding pages, served a tour of duty at the Academy as her commander.

One of these photographs, depicting her three masts with their yards and sails, is interesting as illustrating the conservatism of the Spaniards of the 80's, the era when senior officers even in our own Navy were still somewhat skeptical of "tin pots." Then too, wind was cheaper than coal, a telling argument with taxpayers. And lastly, furling sail in heavy seas, with the thermometer hovering around zero, made real sailors. This latter point was emphasized in the revival of full-rigged training ships like the *Severn* for our midshipmen. All of which arguments were common a quarter of a century after the Civil War had taught the world to strip the rigging from ships of war.

The above notes were prepared for the PROCEEDINGS by Professor H. F. Krafft, the curator of the Naval Academy museum.

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Old Copies Wanted

The Institute each month prints several hundred extra copies of the PROCEEDINGS to take care of demands for back numbers. The supply of the issue for May, 1929, and October, 1930, is so nearly exhausted that the Institute will gladly give twenty-five cents credit on members' dues for copies of either issue.

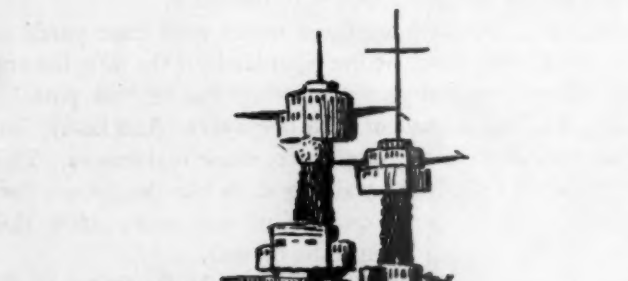
Membership

The regular and associate members of the Institute can be of real service to the organization as a whole by bringing to the attention of friends and associates our work and aims. Membership in the Institute entitles one to receive the PROCEEDINGS each month without additional cost. The Secretary hopes that members will continue to send in nominations of those whom they feel are interested in our Navy, its

JUN 4 1931

traditions, history, activities, developments, and in the sea, and all things nautical. Since January first we have received 176 new members.

New Definitions The following definitions, taken from an examination on A to N subjects in the *Bluejacket's Manual,* were furnished by Lieutenant Commander George B. Wilson, U. S. Navy:

Capstan—The commanding officer.
Compass—A small stove.
Gaff—Ship small talk.
Scupper—A utensil used for drinking, hence the expression "a scupper of coffee."
Hatch—A box where eggs are kept.
Halyards—A nautical name for impishly inclined sailors.
Tiller—Officer in charge of the pay roll, sometimes called the paying tiller.
Tack—To handle the boat diplomatically.
Binnacle—A bivalve that fastens itself to the bottom.
Sextant—One who officiates at funerals at sea.

Prize Essay—Assistance With The winner of this year's prize essay, Lieutenant Franklin G. Percival, has requested the Secretary to say that the author of that essay is indebted to Lieutenant Commander A. R. Early, U. S. Navy, for valuable criticism.